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THE UNIVERSITY OF ALBERTA

A MULTIVARIATE STUDY OF EXTROVERSION

by

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A THESIS

SUBMITTED TO THE FACULTY OF GRADUATE STUDIES AND RESEARCH

IN PARTIAL FULFILMENT OF THE REQUIREMENTS FOR THE DEGREE

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THE UNIVERSITY OF ALBERTA

FACULTY OF GRADUATE STUDIES AND RESEARCH

The undersigned certify that they have read, and recommend to the Faculty of Graduate Studies and Research, for acceptance, a thesis entitled, "A Multivariate Study of Extroversion" submitted by Douglas Mervin Wardell in partial fulfillment of the requirements for the degree of Doctor of Philosophy in Psychology.

Joseph R. Royce
Supervisor

Wm. W. Rozeboom

T. Weckowicz

John D. Hundleby
External Examiner

Date . . July 7, 1976.

ABSTRACT

The objective of the study was to substantiate and clarify the construct of "extroversion" and to compare two multivariate versions of this construct; namely, those of H. J. Eysenck and R. B. Cattell.

Fifty-eight variables were selected from the questionnaires and objective tests developed by Eysenck and Cattell and given to 208 college subjects (116 male, 92 female). The variables were distinguished as lower or higher-order (i.e., derived from lower-order variables) and because of wide-spread sex differences, the 53 lower-order variables were mean deviated separately for each sex. Correlations between higher-order variables and lower-order variables were examined for both sexes separately and combined. Forty-nine of the 53 lower-order variables were then factored according to the Image Model, and a number of criteria were used to evaluate the number of factors (including the Kaiser-Guttman rule, Cattell's Scree Test, Joreskog's Chi-square significance test, and Kaiser's suggested Residualization procedure). The Harris-Kaiser Independent Clusters transformation appeared (blindly) to give the best solution. Scores on the resultant factors were then correlated with the five higher-order factor variables, including Cattell's QI (Exvia), QII (Anxiety), QIII (Cortertia) and QIV (Independence), and Eysenck's E-I (Extroversion). The reader is referred to the Analysis section of this paper for a detailed account of the method.

Thirteen factors appeared to be invariant at the first-order level, including Cattell's QI, QII, QIII, QIV and QVI (Realism), QVIII (Good upbringing), and objective test factors U.I. 16 (Assertiveness), U.I. 21 (Exuberance), U.I. 28 (Self-assuredness) and

U.I. 32 (Exvia). Good upbringing was considered to be a likely match for inhibition (U.I. 17) in objective tests. Higher-order analyses showed QI and U.I. 32 loading on one second-order factor and "Social inhibition" at the third order. QVIII and markers for U.I. 17 loaded on a third-order "General inhibition" factor that was positively correlated with Social inhibition.

The results substantiated the view that extroversion and "social inhibition" are distinct from good upbringing and "general inhibition", each based on second-order factors in questionnaires (QI and QVIII) and first-order factors in objective tests (U.I. 32 and U.I. 17). At the higher order, these factors load on a single factor similar to Cattell's FIII (Temperamental ardor) in objective tests or Qα (Inhibition) in questionnaires. The implication is that although the extroversion measures of Cattell and Eysenck are fairly close empirically, the concept upon which Cattell's exvia is based is more closely identified with the second-order social inhibition or extroversion factor in this study, while Eysenck's extroversion is probably more closely identified with the putatively constitutional higher-order inhibition factor (FIII or Qα) found in this and other studies. The concepts of sociability ("Social extroversion") and impulsivity ("Lack of self control") developed by Eysenck since Carrigan's (1960) original suggestion of these "dual" aspects of extroversion would correspond with social inhibition and good upbringing or general inhibition respectively. In accordance with this view, sociability and impulsivity scales from Eysenck's questionnaire measure of extroversion load separately on the extroversion (QI) and good upbringing (QVIII) factors in this study.

Eysenck's and Cattell's measures of extroversion correlated over 0.80 with the extroversion factor from the present study and they correlated about 0.70 with each other. Eysenck's measure showed slightly higher correlations with other factors such as QIII, Cortertia, and QVIII, Good upbringing. The present extroversion factor and Cattell's exvia were associated with better adjustment and lower anxiety, while Eysenck's extroversion was relatively uncorrelated with adjustment and anxiety.

Other results indicated possible sex and age differences in the factor markers for cortertia, independence, extroversion and assertiveness, and somewhat different relationships among these factors for males and females. These differences may reflect somewhat different ontogenetic determinants of social inhibition for each sex.

The basic psychological concept of extroversion postulated by Jung, Murray, and Cattell is considered replicated in the present study. The biologically-based concept of extroversion carefully developed by Eysenck through extensive experimentation is also considered substantiated factor analytically. It is proposed that conceptual divergencies between Cattell and Eysenck regarding the nature and functioning of extroversion may be resolved by viewing Eysenck's concept of extroversion at a higher stratum than Cattell's exvia.

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PART I

INTRODUCTION

Research Objectives

The primary objective of this research is to investigate the functional unity and lower-order dimensionality of extroversion. First, an attempt is made to substantiate and clarify the concept of extroversion by factor analysis. Specific questions addressed are: (a) Is extroversion a functionally unitary source trait? and (b) What is the relation between extroversion (if unitary) and certain other personality factors? Second, the concepts of extroversion emerging from the laboratories of H. J. Eysenck in England and R. B. Cattell in America are to be compared on the basis of these findings. It is hoped that theoretical differences between these concepts would be revealed in a joint factor analysis of questionnaire and objective test variables.

CHAPTER ONE

THEORETICAL CONSIDERATIONS

Cattell's and Eysenck's theories of personality have existed almost as alternatives to each other, with little reconciliatory work done between them, either at the theoretical or empirical level. This is particularly true for their concepts of extroversion. In order to examine their similarities and differences, it is important to put these contributions into a brief historical perspective.

Roback (1927), Eysenck (1973) and others have pointed out that the term "extroversion" had a long history before Jung introduced it as a psychological construct in his Psychological Types (1923). In particular, the term appears to have been adopted originally by physicists and chemists from the Latin "extro" (outwards) and "versio" (to turn)[1], to designate the property of physical substances to manifest certain unseen physical attributes under certain conditions (see Murray, 1897). The term was then used to refer to a somewhat analogous tendency on the part of human beings to turn thoughts and feelings upon external (outward) objects as opposed to internal states and events (Murray, 1897; Roback, 1927).

Freud, for example, used the expression "introversio libidinis sexualis" to refer to the tendency to turn the sexual libido from external cathexes to internal fantasy objects, as a preliminary aspect of psychoneurosis.

In most early uses of the term, it is clear that extroversion was simply meant to describe certain manifest consistencies in the activity of people and substances. Whether these consistencies analyzed into a single unitary underlying characteristic of those persons or substances was a further question.

That further question was explicitly addressed by Carl Jung (1923) when he proposed two underlying attitudes, extroversion and introversion, which interfaced with psychological functions of thinking, feeling, sensing and intuiting. In his volume, Psychological Types, he outlines the attitudes as follows:

> Introversion: means a turning inward of the libido whereby a negative relation of subject to object is expressed. Interest does not move towards the object but recedes toward the subject. Everyone whose attitude is introverted thinks, feels and acts in a way that clearly demonstrates that the subject is the chief factor of motivation while the object at most receives only a secondary value. Introversion may possess either a more intellectual or a more emotional character, just as it can be characterized by either intuition or sensation.... When Introversion is habitual, one speaks of an introverted type (1923, p. 567).
>
> Extroversion: means an outward turning of the libido. With this concept I denote a manifest relatedness of subject to object in the sense of a positive movement of interest towards the object. Everyone in a state of extroversion thinks, feels and acts in relation to the object, and moreover in a direct and clearly observable fashion, so that no doubt can exist about his positive dependence upon the object. In a sense, therefore, extroversion is an outgoing transference of interest from the subject to the object. If it is an intellectual extroversion, the subject thinks himself into the object, if a feeling extroversion then the subject feels himself into the object. The state of extroversion means a strong, if not exclusive, determination by the object.... Should the state of extroversion become habitual the extroverted type appears (1923, p. 543).

Marshall (1967) has recently pointed out that Jung's further descriptions and elaborations of these attitudes were meant as a rather superficial "summing-up" of broad surface consistencies which are influenced by the proposed functionally unitary source trait.

> The major part of Psychological Types consists not of definitions but of descriptions of common types or syndromes. As Jung himself says, such descriptions of pure types are "only Galtonesque family portraits which sum up in a cumulative image the common and therefore typical characters, stressing these disproportionately, while the individual features are just as disproportionately effaced".... Thus Jung says that the typical extrovert is adjusted to the objective environment, sociable, spontaneous, conservative in outlook, subject to psychosomatic disorder, and so on. However, this composite portrait of the type is not advanced as the definition of extroversion, but as a group of correlated variables usually found in extroverted people (p. 117).

In contradistinction to Freud, Jung (1923) stated "It is a mistake to believe that introversion is more or less the same as neurosis. As concepts the two have not the slightest connection with one another."

In a review of Jung's conceptualization, Murray (1938) decried the "miserable vulgarization" of his types by American psychologists, but noted that it is very difficult to discern the essential aspects of the functional unity Jung proposed. From his conceptual analysis, Murray suggested at least two distinct aspects were implicated in Jung's description; namely, "extraception-intraception" and "outward and more social vs. inward and less social" activity.

Extraception - intraception, as Murray conceived it, is a very similar process to that implied by earlier uses of the term extroversion; namely, the tendency to orient oneself upon the external "objective" world, as opposed to the internal, psychological or "subjective" world. In Murray's terms, "The extrovert perceives, understands and values the world as it affects his senses....; the introvert, on the other hand, being chiefly influenced by psychic processes... (p. 237f)." This is quite comparable to earlier descriptive uses of the term extroversion, including Freud's "introversio libidinis sexualis."

Regarding the other aspect, Murray comments:

> Putting aside extraception and intraception (objectivity and subjectivity) which seem to describe attitudes that are clearly different from the other factors, we come down to a very crude division between the outward and more social and the inward and less social. The extrovert seems to be the simple, healthy, uninhibited, readily adapting herd animal, whereas the introvert is somewhat held back within himself. My own opinion is that Jung has been misled by the supposition that there must be one reason why the introvert is held back... (p. 239).

Murray appears to be suggesting that Jung's concept of extroversion is analyzable as basically an external vs. internal orientation (attitude), while many of the superficial behavioral characteristics associated with extroversion (and emphasized by American psychologists) are not exclusively determined by that attitude alone.

However, Jung's major contribution was to suggest that extroversion is a pervasive functional unity, involved not only in perception and cognition, but also in overt social behavior. As already indicated, Murray challenged the view that extroversion - introversion, as a functional unity, has exclusive influence that Jung may have implied for it. The situation is complicated by Jung's further views that both extroverted and introverted attitudes (types) could exist for a single person, one being more conscious than the other, but both in a balance of strength. Murray (1938) also suggested the possibility of manic-depressive swings for extroversion - introversion.

After Jung's seminal contribution, many writers proliferated divergent and overlapping views as to the behavioral description of extroversion (see Freyd, 1924). Wells (1917) emphasized avoidance; the

Allports (1920), "the tendency to action"; Nicoll (1920), impulsiveness; McDougall (1929), "emotional response"; Freyd (1924), social relations. While some (e.g., McDougall) believed that introversion and extroversion were different traits,[2] others held they were polar or modal values on a single trait. Conklin (1923), for example, suggested the term "ambivert" for the majority between the polar extremes. At the same time, many theoretical speculations about extroversion were proposed by Tansley, McDougall, Kempf, and White, among others (see Freyd, 1924).

Another prominent question since Jung has been the interpretation of extroversion and introversion as "traits" and "types." Cattell (e.g., 1973a) has maintained the view that extroversion - introversion is a trait, while Eysenck has preferred to call the polar extremes "types." It is probably not necessary to consider these views to be in conflict, since, as Cattell (1957a, 1973a) has pointed out, the word "type" for a theoretical construct in personality is most viable to designate either modal patterns on a single dimension and/or modal profile patterns across dimensions. Eysenck's use of the word "type" conveys the view that extroversion is descriptively designated by a specific pattern of behavior across a wide variety of situations. The word "type" is also often used complementary to "trait," as a designation of a group of individuals who are similar on a trait or compilation of traits. This is also compatible with Jung's usage (see descriptions above and Stephenson, 1939) and Eysenck's usage (e.g., Eysenck, 1964; 1970a; 1973).

The constructs of extroversion and introversion, however conceived, have received the attention of psychometricians for over fifty years. Freyd (1924) suggested a list of 54 surface manifestations, from which Heidbreder (1926) was unable to discern a single functional unity by inspecting the intercorrelations of ratings on 100 men and 100 women. A rating scale was also developed by Laird (1925), but again, Oliver (1930) disputed a single source trait within the Laird scale. Conklin, who had earlier suggested the term "ambivert" for the middle range on an extroversion - introversion dimension, also (1927) invented a ratio measure of "extroverted" to "introverted" interests for that dimension.

Neymann and Kohlstedt (1929) produced a set of questionnaire items, as Freyd had for ratings, which was revised by Gilliland and Morgan (1932) as the Northwestern University Introversion - Extroversion Test. Bernreuter (1933, 1934) and Stagner and Pessin (1934) also used various criterion selection procedures for items for their own questionnaires.

Reviews of the interrelationships of these (and other) scales purporting to measure "extroversion" by Conklin (1927), Gilliland (1934), Guilford and Hunt (1931), Guthrie (1927), Stagner (1932), and others, found little in common among them.

An important contribution to the controversy was made by Woodworth (1931), reflecting a theme to reappear in Carrigan's (1960) conceptual analysis of later questionnaires. Woodworth suggested that scale items variously used to assess extroversion appeared to address either the tendency to immediate overt action (Carrigan's "Lack of Self Control" or "Impulsivity") or social activity (Carrigan's "Social Extroversion" or "Sociability"). The implication was that extroversion - introversion, as a functionally unitary source trait, was probably not jointly influential for both clusters of behaviors. This point of view was also reflected in Murray's (1938) comments, cited earlier, that "outward and more social vs. inward and less social" behavior probably did not have only extroversion - introversion as its basis. It is further reflected in Abernethy's (1938) distinction between the "liking thought" and "liking people" items of the Neymann-Kohlstedt test of introversion and extroversion.

In the 1930's, significant new steps were taken through Guilford's pioneer efforts to apply factor analysis to temperament in much the same way that Spearman had already applied the methodology to the domain of intelligence. Since earlier speculations, rating tests and questionnaires were inadequate as criteria (Guilford and Braly, 1930a, b; Guilford and Hunt, 1931; Guilford and Guilford, 1933), Guilford (1934) finally selected 36 relevant items (including sex) and factored their intercorrelations, finding only group factors, rather than a "general" extroversion factor across all items. In a series of factor analyses (Guilford, 1934; Guilford and Guilford, 1936; Guilford and Guilford, 1939a, b), he further identified the group factors in extroversion as S (Social extroversion or sociability), T (Thinking extroversion), and R (Rhathymia or "freedom from care"), factors which, along with D (Depression) and C (Cycloid disposition) formed the STDCR Inventory (Guilford, 1940). More group factors subsequently formed other inventories by Guilford and his associates.[3]

The Guilford-Zimmerman Temperament Schedule (Guilford and Zimmerman, 1949) and the more recent GZTS (Guilford and Zimmerman, 1956) were designed to measure the original extroversion factors, S, T and R, along with the other scales developed earlier (except I and N, with C and D combined into a single E: Emotional Stability scale).

Concurrent with Guilford's pioneer factor analytic work demonstrating the multifactorial nature of items purporting to measure extroversion, other investigators continue to develop _ad hoc_ scales as interpretations of Jung's conceptualization (e.g., Myers-Briggs Type Indicator, Myers, 1962; Stricker and Ross, 1964; Gray and Wheelwright Psychological Type Questionnaire, Gray and Wheelwright, 1946). In addition, scales such as the MMPI Social introversion scale (Drake, 1946) and the Minnesota Thinking, Social and Emotional (T-S-E) extroversion scales (Evans and McConnell, 1941) were also developed at this time. The T-S-E scales were designed to provide independent measures of the facets of extroversion found by Guilford (see Goldberg, 1970).

As factor-analytically derived scales were produced along with scales based on more traditional rational _ad hoc_ procedures or "rational-empirical" criterion selection procedures, many factor analysts have adopted the point of view towards other types of questionnaires that is clearly expressed by Tatro (1966) with respect to clinical assessment:

> In the language of factor analysts, such instruments are measuring _surface traits_, i.e., they are geared to detect familiar patterns of covarying symptoms or characteristics at a descriptive level. A more basic level of measurement provides information on _source traits_, or the less obvious, underlying influences which determine the observable variation in surface-trait patterns.
>
> In the measurement of source traits we have an analytic, as opposed to descriptive, means of diagnosing personality. No

> longer do we arrive at a measure indicating the extent to which an individual manifests a given variety of pathology, but instead have measures on several basic dimensions of personality, dimensions which are common to all people, normal as well as abnormal, and which in various extreme combinations may be considered determiners of the different patterns of pathology. We discover the "why" rather than the "what" of pathology (Tatro, 1966, p. 134).

From this point of view, the early suspicions of Murray and Woodworth were partially vindicated by Guilford: no single functional unity was found to influence all of the surface traits thought to be manifestations of extroversion. The existence of a functional unity comparable to that suggested by Jung was not demonstrated. Two factor analysts have since made strong claims for the functional unity of extroversion: H. J. Eysenck and R. B. Cattell.

Eysenck's work (e.g., Eysenck, 1947) originated with a criterion-selected questionnaire (Maudsley Medical Questionnaire) designed to distinguish neuroticism and hysteria - dysthymia for servicemen. However, Eysenck (1947) reported a general unrotated factor running through Guilford's items for his S, E, and M scales, and North (1949) found that two very broad factors appeared through all the items for the STDCR scales. North labelled these two factors by the scales that dominated them: C (Cycloid disposition) and R (Rhathymia). These findings lead Eysenck (1953) to reassert Jung's concept of extroversion as a functional unity in ratings and questionnaires.

Eysenck (1956a) developed his own measure of the construct of "extroversion - introversion" (E-I) originally by selecting items from Guilford's S (Sociability), D (Depression), E (Emotionality), R (Restraint vs. "rhathymia", or freedom from care), G (General

Activity) and A (Ascendance) scales that distinguished between high and low R scores. Both the extroversion scale so derived and the neuroticism scale (N, derived from scales that distinguished high and low C scores) correlated with Guilford's S, prompting Eysenck to distinguish social shyness from neurotic shyness.[4] By selecting out those items which distinguished sexes, Eysenck constructed the MPI (Maudsley Personality Inventory). Then, by further selecting out those items which overlapped with his neuroticism dimension, he constructed the EPI (Eysenck Personality Inventory) which is used today.

Eysenck's formulation of extroversion has relied on experimental tests of explicitly stated theoretical hypotheses. Therefore, measures of E-I have been postulated on theoretical bases, rather than simply through "blind" factor analytic procedures. A great deal of effort has been put into demonstrating E-I in more "objective" measures than behavior ratings and self-evaluations (e.g., Eysenck, 1952). Contemporary objective test measures of E-I reflect Eysenck's (1970a) theory that extroverts are less cortically aroused than introverts, most likely as a result of greater constitutional inhibitory activity in the reticular activating system. As a result, most objective tests of E-I depend on extensive time and apparatus, individual administration, and careful attention to procedure (e.g., Eysenck, 1952; Hildebrand, 1958; Becker, 1959; Howarth, 1963). One measure that may be relatively simple is Eysenck's recent "lemon-drop test," in which salivation is measured when the subject is stimulated by lemon drops on the tongue (e.g., Corcoran, 1964; Eysenck and Eysenck, 1967a, b). This measure has received some support (e.g., Howarth and Skinner, 1969; Wardell, 1974) and some criticism (Howarth and Skinner, 1969;

Ramsey, 1969; Power and Thompson, 1970; Wardell, 1974) based, at least in part, on procedural difficulties.

Eysenck has described his construct of extroversion as follows:

> The typical extrovert is sociable, likes parties, has many friends, needs to have people to talk to, and does not like reading or studying by himself. He craves excitement, takes chances, often sticks his neck out, acts on the spur of the moment, and is generally an impulsive individual. He is fond of practical jokes, always has a ready answer, and generally likes change; he is carefree, easygoing, optimistic, and likes to "laugh and be merry." He prefers to keep moving and going things, tends to be aggressive and lose his temper quickly; althogether his feelings are not kept under tight control, and he is not always a reliable person.
>
> The typical introvert is a quiet, retiring sort of person, introspective, fond of books rather than people; he is reserved and distant except to intimate friends. He tends to plan ahead, "looks before he leaps," and distrusts the impulses of the moment. He does not like excitement, takes matters of everyday life with proper seriousness, and likes a well-ordered mode of life. He keeps his feelings under close control, seldom behaves in an aggressive manner, and does not lose his temper easily. He is reliable, somewhat pessimistic, and places great value on ethical standards (Eysenck and Eysenck, 1969, p. 118f).

It is noticable in these theoretical descriptions that Eysenck's emphasis with respect to Jung's concept is towards empirical observations, or what Murray had called "outward and social vs. inward and less social" behavior, particularly rapid, impulsive activity, rather than towards somewhat vague psychological concepts like "extraception vs. intraception" as theoretically underlying orientations of extroverts and introverts. Rather than appeal to such concepts, Eysenck has attempted to link E-I to the more explicit physiological concepts of arousal and inhibition of the central nervous system (Eysenck, 1966; 1970a, b). As a result, Eysenck himself (e.g., 1973) and some observers from the analytic tradition (e.g., Shapiro and Alexander, 1975) suggest that Eysenck's E-I is quite distinct from Jung's original conception.

R. B. Cattell's characteristic orientation, in contrast, has been to systematically sample the entire "personality sphere" to discover from the analysis of surface traits (i.e., syndromes of covarying behaviors which superficially characterize individuals to facilitate everyday predictions of behavior), the pervasive source traits (i.e., those functional unities that underlie superficial consistencies and inconsistencies). This comprehensive orientation was explicitly set out as a program in his early theoretical text (Cattell, 1946), and it has dominated his contribution to trait theory ever since (Wardell, 1976a).

Applying factor analytic methodology and the concept of simple structure, Cattell (1943a, b; 1945a) began with 35 surface traits distilled from the list of over 4000 trait words given by Allport and Odbert (1936). Rating scales were developed for these 35 surface traits, and factor analyses of this "life history" or "L-data" (Cattell, 1945b; 1947a, b) revealed about twelve source traits. Questionnaire items ("Q-data") were written and early factor analyses of short scales of these items (Cattell, 1950; 1956a, b) revealed at least sixteen source traits, some of which showed some similarity to traits discovered in L-data. As a third stage, measures have been developed from objective ("nonfakeable") tests or "T-data" aimed at further expansion and exploration of the personality sphere (Cattell, 1948, 1955). Research findings with objective tests have been summarized by Hundleby, Pawlik, and Cattell (1965) and many of the test themselves were compiled by Cattell and Warburton (1967). Specific batteries of best objective tests for source traits are being developed by Schuerger and Cattell (1976), Hundleby and Cattell (1971, 1976) and Wardell and Cattell (1976). Cattell's extensive efforts to substantiate, interpret and clarify the factors from this research have been summarized in a major integrative text (Cattell, 1973a) which condemns many traditional approaches to the identification and measurement of personality constructs, including the view of Eysenck that only a few higher-order personality traits are invariant and influential in behavior (Wardell, 1976b).[5]

From the factor analyses of questionnaire and behavior rating variables, Cattell (1945b, 1946, 1950) maintained that extroversion could only be considered a surface trait, unsubstantiated as a functionally unitary source trait, at least at the first-order level.

When the first-order structure of sixteen or more factors in Q-data was sufficiently invariant, he (1956b) began higher-order analyses from the primaries. An immediate and invariant discovery (Cattell, 1957a) was a factor labelled QI in questionnaire data and titled "exvia vs. invia," which appeared along with at least three other secondaries, labelled QII (Anxiety), QIII (Cortertia), and QIV (Independence). Gorsuch and Cattell (1967) state that QI, Exvia-Invia ("living outward or inward," from the Latin vita) was so named "to differentiate it from popular connotations of extroversion - introversion which overstress the role of sociability (however, the classical psychological definition of extroversion as being externally oriented is fitting)." In this way, Cattell has attempted to distinguish the replicable source trait (closely resembling Murray's concept of "extraception vs. intraception" that he saw as central to Jung's concept of extroversion) from its influences on various surface aspects of personality (e.g., sociable and impulsive behavior) which make up the popular concept of extroversion.

On the basis of the loadings of the 16 Personality Factor (16 PF) test primaries, Cattell describes the more "exviant" person as

> more cyclothyme (warm, sociable; A+), more dominant (dominant, aggressive; E+), more surgent (enthusiastic, talkative; F+), more adventurous and bold (high Parmia; H+), more shrewd (sophisticated, polished; N+), and more group dependent (dependent, imitative; Q_2-) (Hundleby, Pawlik, and Cattell, 1965, p. 292).

Independently of the 16 PF, Cattell has found a number of factors from objective tests, one of which (given a Universal Index number, U.I. 32) appears to be related to QI in the questionnaire domain and is called "exvia-invia" also. It should be noted that Cattell, like Eysenck, has had great difficulty finding good measures for his construct from among objective tests. In review, Cattell and his associates state:

> In the questionnaire realm, this factor has a clear and sustained pattern, but in terms of objective tests, the loadings have tended to be highly erratic. [6] At present, there appears to be [a] dearth of good markers that have been used in sufficient studies to have influence on matching results (Hundleby, Pawlik, and Cattell, 1965, p. 126).

Still, a number of studies (Hundleby, Pawlik and Cattell, 1965) have discovered and replicated the U.I. 32 pattern, and in joint analyses with 16PF primaries, A, E, F, H and Q_2- have been found to load on the U.I. 32 pattern (e.g., Scheier and Cattell, 1958). Interpreting the objective test markers, Cattell reiterates the interpretation of exvia in terms of external vs. internal orientation, with emphasis on the influence of exvia on unrestrained, carefree activity with respect to the social environment rather than behavioral impulsivity.

> ...it is not a general "social well-adjustment" but a "being oriented towards topics of social impact" that characterizes U.I. 32; in addition, the extrovert is optimistic, less cautious, less critical regarding himself and somewhat self-willed. It is the latter aspects of extroversion which have

occasionally been referred to as "rhathymia" (Hundleby, Pawlik and Cattell, 1965, p. 295).

Based on a number of higher-order analyses of T-data (e.g., Pawlik and Cattell, 1964), U.I. 32 itself appears as a marker on two higher-order factors, FI: "Tied socialization vs. absence of cultural introjection," and FIII: "Temperamental ardor vs. apathy" (Hundleby, Pawlik and Cattell, 1965).

On the basis of these analyses, it is important to note that Cattell and his colleagues consider the replicated factor, exvia, to correspond with Jung's conceptualization:

> We regard the two related factors F(Q)I and U.I. 32 as a close enough representation of Jung's original notion of extroversion - introversion to justify our factor interpretation but called the factor Exvia vs. Invia to avoid confusion with the now less clear term Extroversion vs. Introversion (Hundleby, Pawlik and Cattell, 1965, p. 298).

Elaborating, the authors comment,

> Manifold research efforts have been devoted to investigating behavioral attributes associated with, and criterion performances predictable from, this trait, but less attention has been given to the theoretical exploitation of the source characteristics, the basic "behavioral formula," underlying this personality dimension. Jung suggested an explanation in terms of libido direction: the libido being consciously outward directed in extroversion, consciously inward directed in introversion.... From the projections of U.I. 32 on the second-order OT factors F(T)I and F(T)III a "two" factor theory of Exvia can be formulated. Exvia originates in ready introjection of social values (F(T)I) and higher temperamental ardor (more intensive emotions which are readily overtly expressed (F(T)III)). Invia, on the other hand, is caused by little readiness to internalize cultural standards and higher temperamental apathy (emotions are less intensive and frequent and are very seldom overtly expressed). Factor U.I. 32 thus represents a source trait which is a joint effect of two causes, introjection of social values and temperamental ardor. In combining both, Exvia can be understood as externally controlled extrojection (or tendency to react "outwardly"), Invia is internally controlled introjection (or tendency to react "inwardly").... At the positive, exvious pole of this factor, for example, the higher

> interest in people, the higher sociability, surgency, group dependence, and abundancy of response appear as manifestations of higher external (and less internal) control, while the higher adventurousness and dominance, the lower attitude conformity, accuracy and endurance appear as manifestations of the stronger extrojective tendency (Hundleby, Pawlik and Cattell, 1965, p. 298f).

This theoretical conceptualization of exvia, based on higher-order findings with U.I. 32, is not the only possibility for its evolution and influence that has been elaborated by Cattell. Tentative third-order analyses of Q-data are now coming available (Cattell, 1975), but it is too early to interpret them with respect to the theory just mentioned. However, partly as a result of finding exvia as a source trait at the second-order level in Q-data, Cattell has suggested other alternative views as to its natural history and etiology that are distinct from Eysenck's traditional view that it is based on a constitutional general inhibition and arousal in the central nervous system, mediated by the reticular activating system (Eysenck, 1970a).

Commenting on alternative explanations for exvia as a higher-order factor, Cattell (1973a) distinguishes three theories, the most simple of which is that exvia, like Eysenck's extroversion, corresponds to a constitutional inhibitory mechanism which acts on several primaries. A more complex possibility is that invia develops as a "susceptibility to social inhibition" as a result of the interaction of both constitutional susceptibility to threat and social experience with threatening influences (see also Gorsuch and Cattell, 1965). The resultant inhibition is specific to learning from social situations, rather than being a general inhibiting over-reactivity to any stimulation.

Cattell (1973a) states,

> This social inhibitability theory must not be confused with Eysenck's reactive inhibition theory (Eysenck, 1970[a]) based on a reflexological concept from Hull and Pavlov. The latter is operationally recognized by declining response with repeated unrewarded stimulation (exvia); the former by genetically greater autonomic and other threat response among inviants, which by experience has become relatively strongly conditioned to social stimuli. By this theory the genetic component is shared by F, H, and perhaps A, while the rest, including Q_2(-), comes from a social environment marked by little inhibition (p. 183).

As a third alternative view towards the development of social inhibition, Cattell (1973a) suggests an "interactional emergence or spiral-feedback theory (that certain sets of primaries mutually stimulate growth)." Rather than an internal-external orientation based simply on learned avoidance of socially perceived threats, introversion - extroversion would develop from the molding influence of the social environment on those primary traits that themselves influence social development.

As a possible example, Cattell (1973a) cites:

> This learning theory explanation would suppose, for example, that a child born with high surgency (F having high heritability), quick in the skills that make him "the life and soul of the party," will become more dominant (E) from social reward. His attracting of more friends and acquaintances will also increase affectia (A), since he will respond to warmth with warmth (1973a, p. 183).

In general terms, this view proposes that

> A higher position on any one of the primaries tends, because of social mechanisms, to generate a higher level on the others. In this way, they become correlated, and involved in common experiences, in the course of development. Because of this degree of functional unity, it becomes economical to give a single score to show how far a person has proceeded in this process (Cattell, Eber, and Tatsuoka, 1970, p. 117).

Favouring this theory somewhat, Cattell (1973a) states,

> Exvia - invia leads itself even less than anxiety to the possibility of the standard second-order causal action. It is not easy to imagine what could simultaneously increase affectia (A), surgency (F), parmia (H), and group dependency (Q_2-). For one thing, surgency has a high inheritance...that is difficult to reconcile with its substantial loading on exvia if it is a dependent variable.... Although I am by no means rejecting the standard strata model, other models are to be explored and one is the spiral feedback. Spiral feedback supposes that one factor - F in this case - is genetically high and propels the individual into situations where the three other primaries are favoured in development. For example, since the high F person seldom retreats from social difficulties he might become skilled in social intercourse as in the affectia factor A. This ability to empathize with people could in turn excite warm reactions from others and thus produce the sense of security seen in the H primary. Even with two factors of appreciable genetic determination like F and Q_2 there could be a statistical effect beyond additivity. The spiral-feedback theory proposes that by a series of mutual and partly serial interactions, beginning mainly with the most genetic primaries, a common increase is generated in the primaries. The unity that is statistically visible in the second-order is here the unity of a process - a process of creating an "emergent" by interaction of existing primaries. It is a process of positive mutual or serial (spiral) feedback among the primaries in relation to lifes' situations, which makes the level of each primary a cause and a consequence. As determinations of loadings become more exact it should be possible, by watching changes of the pattern over age, to decide between the theory of the second-order as a cause and as a consequence (p. 136f).

In reviewing the communalities between Cattell and Eysenck on extroversion, Carrigan (1960) reflected the earlier distinction of Woodworth (1931) in suggesting that their notions of extroversion stressed two relatively distinct features, social activity (sociability) and immediate overt action (impulsivity). In fact, Carrigan reported three analyses by Mann (1958) showing that Sociability (or Social Extroversion) and Impulsivity (or Lack of Self Control) may be replicable factors, differentially related to the concepts of extroversion of Cattell and Eysenck. These analyses show Social Extroversion to be marked by all of Cattell's first-order extroversion factors, particularly E (Dominance) and H (Parmia), in addition to Guilford's G (General Activity), R (Rhathymia), A (Ascendance), and S (Sociability). Lack of Self Control was marked particularly by Cattell's G- (low Superego Strength), I (Premsia), and Q_3- (low Strength of the Self Sentiment), and also by F (Surgency) and Guilford's R (Rhathymia). While Cattell's Exvia and Social Extroversion appeared similar, Carrigan suggested that Eysenck's E-I could be identified more readily with Lack of Self Control.

Frank and Sonja Farley (1970) also suggest that a greater contribution in the theoretical relatedness of Eysenck's E-I to arousal and inhibition is made by an impulsive component relative to a sociability component.

On the other hand, it is obvious from Cattell's writings that, as Carrigan shows, he emphasizes the more social aspect of extroversion. Cattell, of course, considers "sociability" and "impulsivity" to be surface traits (clusters of correlated behaviors) rather than source traits (underlying determinants, factors). His "sociability" cluster is largely determined by H+ (Parmia) (see Cattell, 1957a, Appendix 4), while "impulsivity" is largely determined by G (Superego strength) (see Cattell, 1971, p. 369f).

The factors of "Sociability" and "Impulsivity" identified by Carrigan (1960) from Mann's analyses would appear to be clear replications of two second-order factors for Cattell: QI (Exvia - invia), and QVIII (Superego strength vs. lack of self-sentiment), the latter clearly marked by G and Q_3 (Cattell, 1973a, p. 116).

Adcock (1965), in a theoretical comparison between Eysenck and Cattell, has argued that the two syndromes suggested by Carrigan represent two different generalization effects. The "impulsiveness" syndrome is a generalization of inhibition into strong superego controls (Cattell's G: Superego factor) and strong ego controls (Cattell's Q_3: Strength of the Self-Sentiment factor). Adcock calls this trait "inhibitedness," and suggests that it matches with Cattell's U.I. 17 (general inhibition). The "sociability" syndrome is, to Adcock, a generalization of the person's desire to seek social contacts. Like Farley and Farley (1970), Adcock argues that Eysenck's E-I is theoretically a genetic inhibitory tendency more related to impulsiveness than sociability. Therefore, he concludes,

> It would seem that we must regard Cattell and Eysenck as being in substantial agreement in their measures of extroversion, despite the different theoretical backgrounds -- social inhibition and general inhibition respectively -- from which they may have approached (p. 96).

Adcock's conclusion can only be extended through questionnaire measures of extroversion, for, as Carrigan states,

> Several objective test analyses related to E-I have appeared in recent years -- some carried out by Cattell and his associates, others from Eysenck's laboratory. The latter studies rely heavily on tests of supposed or demonstrated relevance to particular dimensions of personality, whereas Cattell's analyses are based on tests intended to cover the entire "personality sphere." As might be expected, the test batteries used in the two sets of studies differ considerably, and the resulting E-I factors are not readily compared (p. 345).

To summarize these theoretical considerations briefly:

(i) Eysenck's E-I was developed from a wide base of Guilford's factors, particularly R (Rhathymia), and theoretically reflects a more general inhibitedness than Cattell's Exvia;

(ii) Cattell's Exvia is a higher-order source trait possibly arising from social feedback interactions among the exvia primaries A, E, F, H and Q_2-. Theoretically it may reflect social inhibition determined by the interaction and mutual growth of lower-order source traits, particularly F (surgency) and H (parmia vs. threctia or "susceptibility to threat").

(iii) Carrigan, Adcock and others suggest that Eysenck's E-I is conceptually related to a factor of "Lack of self control" or "Impulsiveness," marked by low superego strength (G-) and low self-sentiment strength (Q_3-), with possibly surgency (F+), tender-mindedness (I+) and Guilford's factor that best correlates with F, rhathymia (R). Cattell sees "impulsivity" itself as a surface trait, determined largely by low superego strength (G-). The primaries G+ and Q_3+ are the best markers for a second-order factor QVIII (superego strength vs. lack of self sentiment) that is quite distinct from QI, Exvia. In the domain of objective tests, Adcock suggests that "Impulsivity" corresponds to Cattell's U.I. 17 (General Inhibition);

(iv) Carrigan matches Cattell's "Exvia" to her factor of "Social Extroversion," rather than "Lack of Self Control." "Social Extroversion" or "Sociability" is marked by the exvia primaries, A, E, F, H, and Q_2-, and by Guilford's G, R, A, and S factors. Cattell's surface trait, sociability, is largely determined by H (parmia), which correlates highly with Guilford's S (Sociability), although sociability is considered to be a product of many possible primaries.

Perhaps the theoretical differences between Eysenck and Cattell could be revealed in a joint analysis that included objective tests and questionnaires from both laboratories. Such is the present study.

CHAPTER TWO

EMPIRICAL FINDINGS

Carrigan (1960) points out that early attempts to measure the "trait of extroversion" (e.g., Bernreuter, 1934; Guilford and Hunt, 1932; Hovey, 1929; Moore and Steale, 1934; Stagner, 1932; Vernon, 1938) intercorrelated on the average only about 0.35. Different views with respect to the relationship of extroversion (however measured) and adjustment were proposed to substantiate either Freud's view that introversion is a precursor of neurosis, or Jung's view that these attitudes are independent of adjustment or neurosis.

Studies of Guilford's factor-analytically derived scales have produced a confusing assortment of conclusions. While Guilford himself (1940) proposed that extroversion actually consisted of at least three distinct factors, S (Social Extroversion), T (Thinking Extroversion), and R (Rhathymia), Denton and Taylor (1955) and North (1949) both found a higher-order factor marked by the R and S scales. While Lovell (1945) and Baehr (1952) found R, S, G and A as factors at the first-order level, Thurstone (1951), reanalyzing the same data, found R, S, G, and A items distributed across his own primary factors.[8] Baehr (1952) took Thurstone's factors to the second-order and found R, S, G, and A items again loaded on a single factor (along with Thurstone's own Impulsivity scale).

Mann's reported joint analyses (Carrigan, 1960) of Guilford and Cattell scales found Guilford's S, G, and A with Cattell's H and E prominent on one factor ("Social extroversion") while Guilford's R and Cattell's F (along with G and Q_3) appeared on a second factor

("Lack of self control"). One analysis found Guilford's R falling on one factor and Cattell's G and Q_3 on another factor, suggesting to Carrigan a possible further split in "Lack of self control."

Becker's (1961) comparison of the 16 PF primaries to Guilford questionnaires found a clear association of Cattell's F (Surgency) with Guilford's R (Rhathymia), and a somewhat lower association between Cattell's H (Parmia) and Guilford's S (Sociability) and A (Ascendance). Cattell's extroversion primaries, A, E, F, H, and Q_2- generally correlated with Guilford's S, R, G, and A. In a joint factor analysis of the scales, one factor grouped Guilford's R and T with Cattell's Q_1, while another (labelled "Extroversion") grouped Guilford's G, A, and S with Cattell's H, E, and F.

Bendig's (1962a) factor analyses of Guilford scales replicate these findings. One factor, called "extroversion," was marked by R and T; another factor, called "social activity," was marked by G, A, and S. Bendig hypothesized that Eysenck's E-I would be associated with the former, but found quite clearly that it correlated with the latter factor. In fact, E-I correlated with S more than R. As stated earlier, although Eysenck made up the E-I scale from Guilford's R items, two-thirds of the resultant E-I items also belonged to Guilford's G, A and/or S scales.[9]

Jensen (1958), reviewing the relationship of Eysenck's earlier Maudsley Personality Questionnaire to other questionnaires (such as Heron's Sociability scale, similarly developed from R, and the Social Extroversion scale from the Minnesota T-S-E), concurred with Bendig in suggesting a major social component in E-I.

Eysenck himself was concerned about re-establishing the functional unity and descriptive characteristics of E-I, particularly since Carrigan's (1960) review suggesting that E-I was largely associated with "Impulsivity" rather than "Sociability" or "Social Extroversion." While the historical derivation of E-I might suggest that impulsive behaviors are highly involved as markers (since Guilford's R scale constituted the original criterion), other findings already cited (e.g., Jensen, 1958 and Bendig, 1962a; also, Skinner et al., 1970) have shown that sociability (e.g., items of Guilford's S scale) is more important in marking the factor empirically. Eysenck and Eysenck (1963) found that the items measuring E-I could be factored to result in a single rotated bipolar factor that was marked positively by "sociability" items and negatively by "impulsivity" items. Sparrow and Ross (1964) replicated this finding. A factor analysis of EPI items (Eysenck and Eysenck, 1963) revealed at least four primaries, extroversion, neuroticism, impulsiveness and jocularity, prompting Eysenck to suggest that there were perhaps primary factors (i.e., impulsiveness and jocularity) that were correlated but distinct components of extroversion at the lower-order level.

Further item factor analyses of the EPI (Eysenck and Eysenck, 1969) have found up to 14 primary factors, and 4 at the third-order: Neuroticism, Sociability, Excitement, and Jocularity -- with Extroversion made up of the latter three.

These findings make it difficult to evaluate the functional unity of E-I itself, particularly since the factor intercorrelation matrixes are not reported (see Browne, 1971). Other investigations (e.g., Howarth and Browne, 1972), using item factor analyses, have suggested that Eysenck's concept of extroversion is poorly substantiated and that "extroversion" is actually an inflated conception of a lower-order sociability factor.

Eysenck and Eysenck (1967a) found that the correlations of their objective extroversion factor, measured by the lemon drop test, with items on their questionnaire E-I scale were proportional to the item factor loadings on that scale (rather than the item loadings on the sociability or impulsivity scales), suggesting to them that extroversion is still a unitary dimension.

On the other hand, apparently no study has investigated Cattell's extroversion factors in terms of Carrigan's (1960) and Adcock's (1965) suggestions as to their relationship to "sociability," "impulsivity" and Eysenck's measures of E-I. As stated above, sociability and impulsivity are surface traits (correlation clusters) to Cattell, rather than source traits (factors), and are determined partly by H (Parmia) and G (Superego strength) respectively.[10] Exvia itself continues to emerge as an invariant factor from factor analyses of the 16 PF primaries along with another well-established second-order factor, QVIII (Superego strength vs. lack of self-sentiment) which is marked by G and Q_3, and is quite orthogonal to exvia (e.g., Horn, 1965; Gorsuch and Cattell, 1967; Cattell and Nichols, 1972; Cattell, 1973a).

For example, in a series of careful factor transformations, John Horn's (1965) second-order factor analyses of the 16 PF clearly found exvia and anxiety, and a factor replicated from Karson and

Pool (1958) loading G and Q_3 and termed by them "sociopathic deviance." In addition, Horn found some evidence that I (Premsia) appears at both the first and second-order, and that QIV (Independence) may actually split into two second-order factors, one indicating "radical independent attitudes coupled with dominance," the other indicating "self sufficiency without dominance and extroversion."

Cattell, of course, has maintained since 1956 that extroversion (or QI, exvia) is a functional unity usually marked by 16 PF primaries A, E, F, H, and Q_2-, with F and H being particularly prominent primaries for adults (Cattell, Eber, Tatsuoka, 1970). At least two studies (Becker, 1961; Cattell and Gibbons, 1968) show high correlations between Cattell's F and Guilford's R, and between Cattell's H and Guilford's S.

However, Cattell's views on the invariance of his primaries and higher-order factors have also been subjected to some criticism recently. Again, some investigators have been unable to substantiate Cattell's factors in item factor analyses of the 16 PF (e.g., Howarth and Browne, 1971b; Howarth, Browne and Marceau, 1971) but these studies themselves have been criticized on technical and conceptual grounds (e.g., Cattell, 1971, 1974a, b; Cattell and Nichols, 1972, DeYoung, 1972; Karson and O'Dell, 1974; Burdsall and Vaughan, 1974; Vaughan, 1974). The criticisms of Cattell and his associates have focused on the technical methodology of the reported factor analytic solutions in terms of their own strict criteria, particularly with respect to the number of factors extracted and the adequacy of rotation. In addition, they point out that outdated editions of the 16 PF were used.

In the Howarth and Browne (1971a) critique, approximate orthogonality was found at the second-order, without a factor "extroversion," labelled as such. They found a "Sociability" factor, marked by items from the H, F, and Q_2 scales, and an "Impulsivity" factor, marked by items from the G and Q_3 scales. Thus, while these investigators may have been unable to substantiate Cattell's primaries for a number of reasons, they appear to have replicated at least QI (Exvia) and QVIII (Good upbringing) as second-order factors from their item factor analyses of the 16 PF.

In the item factor analyses by Eysenck and his associates (Eysenck and Eysenck, 1969), 99 "best" items from the 1962 and 1966 editions of the 16 PF were solicited from Cattell in order to evaluate the invariance of 15 primary factors (omitting B, intelligence) from the 16 PF. At the first order, twenty factors were found for males and females separately, none of which closely resembled a primary factor from those editions of the 16 PF. Second-order factors were not interpreted or reported in detail. Third-order factors were interpreted as extroversion, neuroticism, and "socialization." While many questions remain unanswered in the brief report of these results, they clearly challenged Cattell and his associates to substantiate the invariance of the present 16 PF primaries. In the dispute over the acceptability of the 16 PF primaries, there is no question that there is an urgent need for more adequate identification and measurement of invariant factors at all levels. In fact, the critical research should stimulate the continued improvement of the 16 PF as the major questionnaire measurement device for these additional factors at all levels.

In fact, more recent studies of the 1968 revised form of the 16 PF have reported factor analyses of 16 PF items (Cattell, 1973a; Burdsal and Vaughan, 1974; Karson and O'Dell, 1974), "parcels" of 16 PF items (Cattell and Gibbons, 1968; Cattell, 1974a), and 16 PF scales across forms (Cattell, Eber and Delhees, 1968; Cattell, Schroder and Wagner, 1969; Cattell, Wagner and Cattell, 1970; Cattell, 1973a) in which the basic structure of the 16 PF has been replicated to a significant degree for many factors. On the basis of such findings, along with applications of 16 PF primaries for description and prediction,[11] Cattell (1972a) argues, contrary to Eysenck (1971), that primary factors are both replicable and of major importance as personality constructs.

The findings that Eysenck's E-I is empirically related to "sociability" scales, factors and items and Cattell's explicit recognition that his exvia-invia is designed to encompass factors and behaviors having to do with external and social orientation, would suggest that their questionnaire extroversion factors should be highly correlated. In fact, they do correlate well (e.g., 0.71, 0.73; from Crookes and Pearson, 1970, and Hundleby and Connor, 1968, respectively). Adcock (1965) reports Becker's (1959) finding that 16 PF exvia and MPI E-I loaded .82 and .68 respectively on a common factor. In addition, Cattell's most prominent markers for exvia, F (Surgency) and H (Parmia), correlated much higher with Eysenck's questionnaire extroversion (+0.62, +0.58) than did such other exvia factors as A (+0.26), E(+0.33), and Q_2 (-0.38) (Hundleby and Connor, 1968).

Of course, many factor analytic investigators have found factors in the questionnaire domain which most recently they have variously called "extroversion" (e.g., Comrey, 1970), "Social extroversion" (e.g., Sells, Demaree and Will, 1970, 1971), or "sociability" and "social shyness" (e.g., Eysenck and Eysenck, 1969; Howarth and Browne, 1971a, 1972; Browne, 1971). However very few studies have tried to compare these factors empirically.

In the extensive item factor analyses of Sells, Demaree and Will (1970, 1971) and Browne (1971), the investigators were constrained, for practical reasons, to very few factors relative to variables, Varimax and Promax transformations and only a first-order analysis and interpretation. Sells et al. (1970) found a "Social Extroversion" factor made up of items from Guilford's A, S, and R scales, and Cattell's A, F, and H scales. A corresponding factor was found when both Guilford and Cattell item sets were factored separately (Sells et al., 1971), and it correlated in each case, as expected, with Guilford's A and S and Cattell's F and H. In Browne's (1971) study, which was under the same constraints, factors of "Impulsivity" and "Sociability" were clearly indicated in a large sample of questionnaire items from various sources.

In the T-data domain, U.I. 32 (Exvia-invia) has been found in a series of investigations by Cattell and his associates (see Hundleby, Pawlik and Cattell, 1965) as a first-order factor among objective tests, loading many of the exvia primaries in Q-data when they are factored together (Scheier and Cattell, 1958).

The objective test pattern for U.I. 32 is based on markers interpreted as indicating an optimistic, self-confident social orientation with fluency relevant to social perception and thinking. These markers include M.I. 763 and 316,[12] fluency on peoples' characteristics, especially oneself; M.I. 112, belief in favorable effects of possible events; M.I. 449, less self-sacrifice believed necessary to achieve life goals; M.I. 108, confidence in performance on untried activities; M.I. 421 and 423, less caution; M.I. 219, fewer common frailties admitted; M.I. 146a, less accuracy; M.I. 282, fluency in perceptions; M.I. 714, superficial word associations; M.I. 696, realism; M.I. 275, efficiency. As stated earlier, the U.I. 32 pattern has been less easily identified and replicated than many other objective test factors.

Other objective test factors that have been more readily replicated and perhaps even mistaken for U.I. 32 in some studies are U.I. 17, General Inhibition; U.I. 21, Exuberance; and U.I. 22, Cortertia. In particular, as previously mentioned, Adcock (1965) has suggested that these may be two major introversion syndromes: one emphasizing sociability, represented by Cattell's exvia-invia; and the other, emphasizing inhibition, represented by Eysenck's E-I, and linked with Cattell's U.I. 17 (Inhibition) and his G and Q_3 factors in Q-data.

Recent factor analyses by Wardell and Yeudall (1976), using an extensive battery of Cattell's objective tests that were administered to clinical patients with problems of "impulsive control," have resulted in three objective test factors that correlated with both G and Q_3. These factors are fairly clear replications of U.I. 24 (Anxiety), U.I. 17 (Inhibition), and U.I. 29 (Wholehearted responsiveness) in normals. Commenting on these findings, Cattell (personal communication, 1976), states

> You have indeed made an important discovery in relation to U.I. 17. For ten years the hypothetical solution for Q-data matching, namely, that second-orders in Q-data are first-order in T-data, has stood at four such matchings, two of them very definite and replicated, namely, that with U.I. 24 [anxiety] and U.I. 32, and two of them quite tentative, namely, that of cortertia with U.I. 22 and of independence with U.I. 19. Now if you look at my 1973 book...you will see that you have obtained in U.I. 17 an excellent match for the second-order factor QVIII, which shows itself in G+, Q_3+ and F-. In the questionnaire domain I have called QVIII "good upbringing," meaning a family atmosphere which brought restraints and standards in regard to behavior and values. You independently argue for U.I. 17 being less of a timid inhibition and more of an acquired inhibition in the interests of more dependable behavior. This comes out particularly in the Wardell and Royce article [Wardell and Royce, 1975]. I was therefore delighted to see that you thus add a fifth match between Q and T series and one which illuminates the nature of U.I. 17.

These results with a sample of forensic patients provide some empirical support for Adcock's contention for the association of U.I. 17 with G and Q_3. Other studies reviewed by Wardell and Royce (1975) show U.I. 17+ (high inhibition) to be associated with (and possibly influential upon) abilities such as slower speed of closure and slower inductive reasoning, cognitive styles such as more extensiveness of scanning, and affective traits such as (for uninhibited persons) interests in "doing, not theorizing," self-confidence, quick reactivity, sociability, emotionality, expressed sympathy and affection. A theoretical elaboration of these findings is being developed (Wardell and Royce, 1976).

With regard to his own exvia-invia and U.I. 17 (Inhibition), Cattell and his associates have stated,

> At present there is no evidence that this U.I. 32 - introversion trait may be associated with timidity or inhibitedness -- nor does the psychometric pattern of U.I. 17 contain any of the typical objective-test introversion markers.... Furthermore,

> U.I. 17 does not load on any of the questionnaire first-order factors that constitute the second-order questionnaire extroversion factor.... These results clearly indicate that U.I. 17+ (inhibitedness) and U.I. 32- (introversion) do in fact represent two different personality dimensions, the factors certainly not being "cooperative" (Hundleby, Pawlik and Cattell, 1965, p. 150).

Still, in fact, U.I. 17 has almost been mistaken for exvia in some studies (Hundleby, Pawlik, and Cattell, 1965, p. 147f), and U.I. 17 has typically been difficult to replicate in some recent studies (e.g., Cattell, Schmidt and Pawlik, 1973; Cattell, Delhees, Tatro, and Nesselroade, 1971).

U.I. 21 (Exuberance) too, has been confused with extroversion - introversion (Meredith, 1966, p. 89f). Comparing U.I. 32 and U.I. 21, Cattell and his colleagues have again stated,

> The individual scoring high in U.I. 32+ is fluent on (own and other people's) personal characteristics (M.I. 763), and more so on his own than on other people's characteristics (M.I. 316); this fluency on self is also high relative to his general verbal fluency (M.I. 273, 283). Since the principal marker for general verbal fluency (M.I. 271) does not load on U.I. 32, it cannot simply be general verbal fluency which accounts for these salients of extroversion; the U.I. 32+ person is only fluent on topics of specific social or personal relevance -- a kind of attitude and interest we intended above in the term "socio-orientedness." The lack of any general verbal fluency distinguishes this factor also very clearly from other primarily loaded factors, such as U.I. 21 (Exuberance) (Hundleby, Pawlik, and Cattell, 1965, p. 294).

Finally, with regard to U.I. 22, Hundleby, Pawlik and Cattell (1965) write:

> ...the original interpretation of U.I. 22+ as a personality pattern characterized by high speed of basic neural processes or an increased "cortical alertness" (which led to the term "cortertia") seems still the most appropriate one (Hundleby, Pawlik, and Cattell, 1965, p. 202).

Cattell later (1972b) suggests that U.I. 22 has the closest conceptual resemblance to the Russian dimension, "strength of the nervous system."

However, he allowed that U.I. 16, 21 and even 32 could also match this concept. Eysenck (1966, 1970a) has contended that this Russian dimension resembles his extroversion factor. Cattell's U.I. 22 is linked, not to extroversion, but to QIII, Cortertia, in the questionnaire domain. U.I. 22 has been hard to replicate generally, if only because of the lack of markers that do not require extensive apparatus and careful individual administration.

Some hypotheses for distinguishing U.I. 17 (Inhibition), U.I. 21 (Exuberance), U.I. 22 (Cortertia) and U.I. 32 from each other at the causal level are iterated by Meredith (1966) and Cattell (1972b). Both Meredith and Cattell focus on some of the same causal hypotheses that Eysenck has offered for his own extroversion factor. This increases the potential for reconciliation by means of objective tests. However, at this point causal explanations are just contending hypotheses.

With regard to U.I. 32 generally, Cattell writes,

> Factorization of personality inventories typically yields clear evidence of an extroversion - introversion factor in the questionnaire realm. In the modality of objective behavior tests only studies from Eysenck's laboratory and the researches carried out in the author's laboratory have identified such a personality dimension. This apparent difficulty of isolating a source trait in objective tests which apparently has very big variance in questionnaire data is indeed very puzzling. Only studies in which the behavioral measures were sampled from a wide domain succeed at all in identifying an objective test extroversion factor, but even there the objective test extroversion factor has typically a small factor variance (in the sense of a small associated latent root) and a relatively wide hyperplane (Hundleby, Pawlik, and Cattell, 1965, p. 296).

Cattell offers two explanations for this; namely, (1) because questionnaire items are more specific than objective test items, questionnaire first-order factors parallel the variable level in objective test first-order factors; and (2) because social behavior is poorly sampled in the present repertoire of objective tests, a strong extroversion factor should not be expected yet.

To summarize generally,

(i) Eysenck's E-I, though theoretically related to the concept of general inhibition and "Lack of Self Control" (Impulsiveness), has been more strongly linked with "Social Extroversion" (Sociability) empirically. Still, E-I is considered unitary partly because of its relation to a physiological measure, the "lemon drop" test.

(ii) Cattell's Exvia is theoretically and empirically linked with "Social Extroversion" (Sociability). Cattell considers Exvia ("outward-living") to be identifiable with the core of Jung's concept of extroversion; that is, an external vs. internal orientation (which Murray termed "extraception vs. intraception"). Therefore, Invia is seen as a reflection of the degree of social inhibition acquired through the interaction of constitutional and developmental forces, resulting in less social responsivity and more attention to inner thoughts and feelings. Exvia has been identified with both QI in Q-data and U.I. 32 in T-data.

(iii) The empirical correlation between E-I and Exvia is fairly high in the questionnaire domain; in particular, they have Cattell's F (Surgency) and H (Parmia) in common. However, the structural relations between these factors and their relatedness in the objective test domain are virtually unexplored.

Therefore, while psychometric comparisons between present extroversion measures exhibit some agreement, there is wide theoretical disagreement and a lack of empirical data as to the generic nature of the construct being measured in both cases. Therefore, the present study attempts to address the generic questions first, and the comparative question second. First, is extroversion a unitary source trait, and if so, how does it relate to other source traits mentioned above? Second, how are the constructs of Eysenck and Cattell related to these findings?

PART II

METHOD

> ... perhaps most important, there is a need for broadly conceived analyses oriented toward extroversion - introversion and its relationship to adjustment. Such analyses would necessarily include a wide array of variables from all media - variables selected for their relevance to the two dimensions, and, when possible, variables of known factorial composition, so that the resulting factors could be compared empirically with previously discovered ones. Until such further steps are taken, the issues raised here are not likely to be resolved.
>
> In the meantime, a word of caution seems in order. If the term extroversion - introversion is to continue in psychological usage - and, judging from past history, there is little likelihood that it will not - care must be taken to specify its conceptual and operational referent. What appear to be minor distinctions between the various conceptions may in fact be crucial ones; to discard them too hastily is likely only to propagate the illusion of a unity not yet established.
>
> \- Carrigan, 1960, p. 357f

CHAPTER THREE

SUBJECTS AND TESTING PROCEDURE

A large test battery was administered to 209 undergraduate students at the University of Alberta (mean age 19.5; standard deviation 2.6), 96 of whom were females, and 113 males. (One male had to be dropped from the analysis which follows.) The subjects (_S_s) were given the battery of tests in groups of approximately eight to ten at a time. All subjects were partitioned off from all others, though the experimenter could see that all tests were being done correctly. This experimenter introduced the task, and then took the subjects through the battery, one test at a time, in unison. The total testing time was approximately two and a half hours.

The test battery will be discussed in the next section. Briefly, it consisted first of a selection of 18 "objective"[13] tests (totalling 32 measures) from a compendium of over 400 tests (totalling about 2400 measures) by R. B. Cattell and F. Warburton (1967). Second, two questionnaires were included: the Eysenck Personality Inventory (EPI) and R. B. Cattell's 16 Personality Factor Test (16PF). Finally, the "lemon drop" test from Eysenck's laboratory was also included, and was the only individually administered test in the battery.

The tests that were administered are given below in the order of administration.

1. T6: Reading Tempo. Four minute timed test.

_S_ has to read four passages; reading tempo is measured by having _S_ mark how far he got in each passage in the time allotted.

2. T13: Criticalness vs. Appreciation of Self and Other Persons. Four minute timed test.

This test used ideational fluency as format. S̲ is asked to list positive and negative personal characteristics about himself and other people. Each of the four combinations for self vs. others and positive vs. negative characteristics is represented by two items. The test is highly speeded.

3. T20. Unstructured Drawings. Four minute timed test.

S̲ is shown, one at a time, a series of abstract line drawings; for each he has to write down all objects, etc., he can identify in it. The test is highly speeded.

4. T23: Pleasant vs. Unpleasant and Past vs. Future Associations. Four minute timed test.

This test again uses fluency of response as measuring device. Each of the four possible combinations for pleasant vs. unpleasant associations regarding the past vs. the future constitutes one item; in each case S̲ has to write down as many applying ideas as he can think of. The test is highly speeded.

5. T25: Book Preferences. Approximately five minutes.

Each item asks for a choice between two fictitious book titles, with the content of each book being indicated in a brief sentence. In each case, there is a contrast between either a morally preferable or a sensational, cheap goal or between either a calm, restrained interest or a readiness to become emotionally embroiled in terror, grief, or vicious action. Liberally timed.

6. T44a and b: Letter and Number Comparison. Five minute timed test.

There are four parts to this test. In Parts A and B the subject compares two columns of letter-combinations (one pair of letters at a time) and checks them as the same or different. In Parts C and D the comparison is between numbers. Parts B and D contain more difficult items than Parts A and C (respectively). This test is highly speeded.

7. T45: Line Length Judgment. Two minute timed test.

The subject is presented with pairs of lines and has to judge whether they are different or equal. The length of the lines to be compared in length is such that a few can be easily distinguished, but most lie near the threshold of certainty-uncertainty. This test is highly speeded.

8. T62b: Hesitancy. One minute timed test.

A highly speeded arithmetic choice test.

9. T64: Friends and Acquaintances. Four minute timed test.

Again, fluency of response is utilized as test format and therefore the test is speeded. First S has to write down the names of his friends and thereafter the names of his acquaintances.

10. T121: Cursive Miniature Situations (C.M.S.) Test. Three minute 36 second timed test.

S is presented with a highly speeded and complex cancellation task, asking for carefulness and fast speed of performance and quick decisions. The test consists of four parts of "runs" each comprising six sections. Each individual section is represented by a pathway inside which small lines are drawn in varying arrangements.

S gains points from cancelling vertical or horizontal lines but loses points for erroneously cancelling slanting lines. S can increase his gain by not circling lines singly but encircling a mass of lines as a whole; however, he is only allowed six such circles per run. The four successive runs increase in difficulty. In addition, less time is allowed per section on runs 3 and 4 than on runs 1 and 2.

11. T167: Preference for Successful vs. Unsuccessful Tasks.

Approximately four minutes.

S is asked to write down activities which he likes very much. Then S has to rate each activity as to how successful he considers himself in it.

12. T187: Practical Jokes. Approximately two minutes.

A series of practical jokes is listed and S has to indicate which ones he enjoys.

13. T361: Hard-Headed Realism Decisions. Three minute timed test.

S is presented with statements about people, events and opinions, permitting either hard-headed and realistic or sentimental, wishful-thinking alternatives. S's extent of agreement to each item is indicated on a five-point scale. The test is strictly timed.

14. EPI. Approximately ten minutes.

(1968 Form A was given).

There was a short rest break at this point. Approximately one hour of testing was completed. The following tests were answered on answer sheets provided, rather than on the tests themselves.

15. T8: Criticalness of Evaluation. Three minute timed test.

In each item S has to evaluate a human performance. The given response alternatives express various degrees of criticalness. The test is moderately timed.

16. T19: Time Estimates for Everyday Tasks. Approximately five to ten minutes.

Each item describes a certain task; in the first part S has to indicate (by choosing one of five possible answers) how long it would take him to complete it, in the second part how long he thinks it would have the average person.

17. T22: Skills-Experience and Confidence. Approximately four minutes.

Some 20 different areas of competence and skills (ice skating, playing the piano, etc.) are listed in this test. A double multiple-choice format is used, and S is to show for each (a) his degree of experience or training in it, and (b) how well he thinks he could manage the particular performance or task.

18. T49d: Counting Letters and Numbers. Two minute timed test.

S is asked to count the number of times certain letters and numbers appear in strings of letters and numbers respectively. This test is highly speeded.

19. T97: Crime and Punishment. Two minute timed test.

S is given a list of crimes, and for each crime he has to (i) indicate on a five-point scale the degree of severity of the crime, and (ii) the amount of punishment that should be given. This test is strictly timed.

20. 16PF. Approximately 30 to 50 minutes.

(1968 Form A was used).

21. The "lemon drop" test. Approximately two minutes per S.

This test was given individually in another room after each S completed the 16 PF.

At the end of the test session, each subject was thanked profusely and given a "Feedback" paper explaining the nature of the research.

A complete transcript of the testing session is provided in Appendix A, along with a more specific delineation of the time involved in each part. Sample objective test items are given in the compendium of tests by Cattell and Warburton (1967). The objective tests are copyright © 1971 by the Institution for Personality and Ability Testing, 1602 Coronado Drive, Champaign, Illinois, U.S.A. All rights reserved. Reproduced by permission.

Some subjects said they were a bit tired at the end of the test session, but many said they found it interesting and enjoyable. In fact, it surprised the investigator to see the subjects take such care and interest in all the tests, especially the last one, the 16 PF. The investigator was very gratified by the concern and responsiveness of the subjects towards the test battery.

CHAPTER FOUR

TESTS AND MEASURES

The tests and measures for this study were selected for their putative relationship to factors of interest. Factors of interest for this study were selected on the following criteria.

1. Cattell and Eysenck are the two major modern proponents of extroversion - introversion. Factors are limited to their taxonomies.

2. Eysenck has three factors in the extroversion domain: higher-order extroversion; and lower-order sociability and impulsivity. All are included.

3. Cattell has six factors in the extroversion domain: exvia, A, E, F, H, and Q_2. All are included. In the objective domain U.I. 32 (exvia) is included.

4. The above constitute the essential factor battery for this study.

5. Additional factors were selected from Cattell's taxonomy of objective factors. This taxonomy runs from U.I. (Universal Index) 16 through U.I. 35. None were selected beyond U.I. 33 because they are too poorly identifiable. Factors were selected if they had:

   (a) Questionnaire correlates which are related to extroversion or exvia (i.e., A, E, F, H, Q_2). These are given in the table on the following page;

   (b) theoretical similarity to extroversion. U.I. 17, U.I. 21, and U.I. 22 could be theoretically related to Eysenck's concept of extroversion.

TABLE I

Questionnaire Correlates of Objective Factors

(from Hundleby, Pawlik, and Cattell, 1965).

U.I.		Questionnaire Correlate
19	(Independence)	H (Parmia), A (Affectothymia)
21	(Exuberance)	F (Surgency)
28	(Self-assuredness)	H (Parmia)
30	(Stolidness)	F (Surgency)
32	(Exvia vs. Invia)	A, E, F, H, Q_2
33	(Dismay)	E (Dominance), Q_2 (Self-sufficiency)

In summary, the following constitute the "extended" battery for this study: U.I. 17, 19, 21, 22, 28, 30, 33.

6. In addition, it was thought well advised to include U.I. 16 (Assertiveness) for the following reasons:

(a) it has been correlated with Guilford's S (Sociability) factor,

(b) it is relatively the most important U.I. factor in Cattell's objective taxonomy (i.e. first factor in the U.I. series, see Cattell, 1957b).

In addition, the remaining 16 PF factors are included. Limiting the study to those 16 PF factors which Cattell relates to extroversion could well leave out 16 PF factors which relate to Eysenck's E-I.

Table II gives a complete list of factors involved in this study at the outset (see pp. 46 - 47).

Tests (given by T numbers) had to be selected to include measures (given by M.I. -- Master Index -- numbers) to mark the objective factors above. Tests were selected from over 400 documented by Cattell and Warburton (1967). Criteria for the selection of objective tests were as follows:

1. Group tests requiring minimal apparatus (exception: Eysenck's lemon drop test). This criterion allowed the study to be more expansive.

2. Tests whose variables are in Cattell's Objective-Analytic Battery (selected by Cattell and others for salience, reliability, factorial simplicity, lack of experimental and algebraic dependence).[14]

3. Other tests whose variables have the above features (except reliability, because reliability data were not directly available).

TABLE II

Complete List of Factors Involved in the Study

FACTOR	MEASUREMENT
A. Essential battery (10 factors)	
Eysenck's Extroversion	EPI
Extroversion	Lemon Drop test
Sociability	EPI
Impulsivity	EPI
Cattell's Exvia	16 PF
A (Affectothymia)	16 PF
E (Dominance)	16 PF
F (Surgency)	16 PF
H (Parmia)	16 PF
Q_2 (Self-sufficiency)	16 PF
U.I. 32 (Exvia)	Objective tests
B. Extended battery (7 factors)	
Cattell's U.I. 17 (Inhibition)	Objective tests
U.I. 19 (Independence)	
U.I. 21 (Exuberance)	
U.I. 22 (Cortertia)	
U.I. 28 (Self-assuredness)	
U.I. 30 (Stolidness)	
U.I. 33 (Dismay)	

Table II (Continued)

FACTOR	MEASUREMENT
C. "Additional" battery (12 factors)	
Cattell's U.I. 16 (Assertiveness)	Objective Tests
B (Intelligence)	16 PF
C (Ego Strength)	
G (Super Ego Strength)	
I (Premsia)	
L (Protension)	
M (Autia)	
N (Shrewdness)	
O (Guilt-proneness)	
Q_1 (Radicalism)	
Q_3 (Self Sentiment)	
Q_4 (Ergic Tension)	

4. Recommendations from Dr. Cattell and his associates. Since good variables to mark U.I. 32 (exvia) are few, Dr. Cattell suggested additions to the battery on the basis of recent research in his lab.

Tables III and IV give the results of the selection of tests for objective factors (see pp. 50 - 55).

Table III gives the list of objective factors for which markers are included in this study. Included are the names of the variables, the tests from which the variables are taken, and the reported loading[15] of each variable on the objective factors for which it is a marker (from Cattell and Warburton, 1967, and Hundleby, Pawlik, and Cattell, 1965, unless otherwise indicated). In many cases, the variables chosen are markers from Cattell's Objective-Analytic (O-A) Battery, and this is indicated by asterisks.

Table IV gives the list of tests included in the study. Included are the time each test takes and the variables and factors involved in each measure taken from each test. An asterisk in the last column indicates that the factor so designated has been marked by that variable in Cattell's O-A Battery. At present, the Adult O-A Battery is being checked and modified by Hundleby (Hundleby and Cattell, 1976). The corresponding O-A battery for subjects of high school age (HSOA) has recently been prepared by Schuerger and Cattell (1976). All tests for U.I. 32 therein have been used in the present study (T 49d, 20, 97, 45, 62b) although some are in slightly different form.

The Measures

The complete list of test measures is reported in detail

TABLE III

List of Objective Test Variables by Objective Test Factors. (Asterisk after variable indicates that the variable is from the O-A Battery for that factor.)

FACTOR U.I.	VARIABLE M.I. Number	TEST T	LOADINGS ON U.I. Factor
1. U.I. 16	278*	6	+ .57
Assertiveness	316	13	+ .16
	282*	20	+ .27
	307	44	+ .25
	308	44	+ .29
	309*	45	+ .52
	15	121	+ .16
	244	361	+ .24
2. U.I. 17	288	8	+ .26
Inhibition -	159 c	19	+ .49
Timidity	282	20	+ .20
	336*	20	+ .38
	325	22	+ .27
	321	25	+ .44
	218	187	+ .46
3. U.I. 19	30*	13	- .09
Independence	159 c	19	+ .45
	472*	64	+ .19

TABLE III (Continued)

FACTOR U.I.	VARIABLE M.I. Number	TEST T	LOADINGS ON U.I. Factor
4. U.I. 21	278	6	+ .59
Exuberance	288*	8	+ .56
	192	19	+ .20
	282	20	+ .20
	108	22	- .15
	147 b*	22	- .17
	307	44	+ .42
	308*	44	+ .48
	309	45	+ .45
	474	64	+ .39
	289	97	+ .63
	244*	361	+ .60
5. U.I. 22	282	20	+ .21
Cortertia	325*	22	+ .44
(Cortical Alertness)	6 a*	49 d	+ .20
	474	64	+ .39
6. U.I. 28	316	13	+ .22
Self-	763*	13	+ .30
assuredness	191*	19	- .27
	192	19	- .29

TABLE III (Continued)

FACTOR U.I.		VARIABLE M.I. Number	TEST T	LOADINGS ON U.I. Factor
7.	U.I. 30	109*	23	- .45
	Stolidness	110*	23	- .33
		1250	167	- .16
		1428	167	- .63
8.	U.I. 32	316*	13	+ .28
	Exvia	763	13	+ .26
		282	20	+ .18
		336	20	+ .17
		307X	45	+ .39 a
		6 a	49 d	? b
		X	49 d	? a
		737	62 b	+ .20 b
		289	97	? b
		1169	97	+ .33 a
		15	121	+ .17 b
9.	U.I. 33	159 c	19	- .42
	Dismay	192	19	- .53
	(Pessimism)	108	22	- .25

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[a] Suggested by R. B. Cattell and associates, Laboratory of Personality Assessment and Group Analysis, University of Illinois. (Loadings column.)

[b] Suggested by Charles Bolz, Laboratory of Personality Assessment and Group Analysis, University of Illinois. (Loadings column above.)

TABLE IV

List of all Tests in the Extroversion Battery. (An asterisk in the last column indicates that the factor so designated is marked by that variable in Cattell's O-A Battery.)

A. Cattell's Objective Tests

	TEST (T)	TIME REQUIRED		VARIABLES (M.I.)	FACTORS (U.I.)
1.	6	4 min. (timed)		278	16*, 21
2.	8	3 min. (timed)		288	17, 21*
3.	13	4 min. (timed)	a.	30	19*
			b.	316	16, 28, 32*
			c.	763	28*, 32
4.	19	5 min.	a.	159 c	17, 19, 33
			b.	191	28*
			c.	192	21, 28, 33
5.	20	5 min. (timed)	a.	282	16*, 17, 21, 22 32
			b.	336	17*, 32
6.	22	4 min.	a.	108	21, 33
			b.	147 b	21*
			c.	325	17, 22*
7.	23	4 min. (timed)	a.	109	30*
			b.	110	30*
8.	25	3 min.		321	17

TABLE IV (Continued)

	TEST (T)	TIME REQUIRED	VARIABLES (M.I.)		FACTORS (U.I.)
9.	44	5 min. (timed)	a.	307	16, 21
			b.	308	16, 21*
10.	45	2 min. (timed)	a.	307X	32
			b.	309	16*, 21
11.	49 d	2 min. (timed)	a.	6 a	22*, 32
			b.	X	32
12.	62 b	1 min. (timed)		737	32
13.	64	4 min.	a.	472	19*
			b.	474	22
14.	97	2 min.	a.	289	21, 32
			b.	1169	32
15.	121	3 min. 36 sec. (timed)		15	16, 32
16.	167	4 min.	a.	1250	30
			b.	1428	30*
17.	187	3 min.		218	17
18.	361	3 min. (timed)		244	16, 21*
B.	Eysenck's Objective Test				
19.	Lemon Drop Test	1 - 2 min.	a.	Trial 1	none
			b.	Difference score	Eysenck's E-I

TABLE IV (Continued)

	TEST (T)	TIME REQUIRED	VARIABLES (M.I.)	FACTORS (U.I.)
C. Eysenck's Questionnaire Test				
20.	EPI	10 min.	a. E-I b. Sociability and Impulsivity	
D. Cattell's Questionnaire				
21.	16 PF	30-50 min.	a. First-order	Factors A through Q_4
			b. Second-order	Factor Q_1 through QIV
E. Sex Variable				
22.	Sex			

below. Where loadings are indicated, reference structure findings are reported. Loadings are given for all known factors, rather than just those factors sought in this particular study. The number in brackets after each loading is the number of studies over which that loading is an average. To be as exhaustive as possible, all average loadings greater than + .15 are reported unless otherwise indicated.

1. T6: Reading Tempo.

M.I. 278 Reading Tempo: faster tempo. Score the average line reached over the four passages.

Reported loadings:

U.I. 16	+ .57 (4)
U.I. 21	+ .59 (1)
U.I. 23	+ .36 (2)

This variable is in Cattell's Objective-Analytic Battery for U.I. 16.

2. T8: Criticalness of Evaluation

M.I. 288 Criticalness: faster speed of judgment. Score the number of items checked.

Reported loadings.

U.I. 17	+ .26 (3)
U.I. 21	+ .56 (3)

This variable is in Cattell's Objective-Analytic Battery for U.I. 21.

3. T13: Criticalness of Self and Others

a. M.I. 30 Criticalness: more criticism of self rather than criticism of others. Score number of criticisms of self minus number of criticisms of others.

Reported loadings:

U.I. 19	- .09 (14) (- .18 in 12)

Despite this reported loading, this variable is in Cattell's Objective-Analytic Battery for U.I. 19.

b. M.I. 316 Criticalness: more fluency about own vs. other people's characteristics. Score number ofiitems appreciative and critical of oneself minus the number of items appreciative and critical of others.

Reported loadings:

U.I. 16	+ .16 (4)
U.I. 25	+ .25 (2)
U.I. 28	+ .22 (3)
U.I. 32	+ .28 (4)

This variable is in Cattell's Objective-Analytic Battery for U.I. 32.

c. M.I. 763 Criticalness: more fluency about people's characteristics, both self and others. Score the number of items appreciable and critical for both self and others.

Reported loadings:

U.I. 24	- .22 (3)
U.I. 28	+ .30 (3)
U.I. 32	+ .26 (6)
U.I. 34	+ .25 (3)

This variable is in Cattell's Objective-Analytic Battery for U.I. 28.

4. T19: Time Estimates for Everyday Tasks.

a. M.I. 159 c Time Estimates: greater inaccuracy of other-referent and self-referent time estimates. The score is based on the assumption that the mean score value, i.e., 3, is the correct time required for each item. Therefore: 5 = 2 marks, 4 = 1 mark, 3 = 0 marks, 2 = 1 mark, 1 = 2 marks.

Reported loadings:

U.I. 17	+ .49 (1)
U.I. 19	+ .45 (1)
U.I. 33	- .42 (1)

b. M.I. 191 Time Estimates: more considered possible for others in a given time. Score 1 to 5 for each of the responses. Five is the score for each of the responses. Five is the score for the shortest time, 4 for the next shortest, etc., in Part II. Sum the scores and divide by the number of questions done.

Reported loadings:

U.I. 28	- .27 (4)

This variable is in Cattell's Objective-Analytic Battery for U.I. 28.

c. M.I. 192 Time Estimates: more considered possible for oneself in a given time. Score 1 to 5 for each of the responses. Five is the score for the shortest time, 4 for the next shortest, and so on to 1 for the longest in Part 1. Sum the scores and divide by the number of questions done.

Reported loadings:

U.I. 21	+ .20 (16)
U.I. 26	+ .16 (3)
U.I. 28	- .29 (6)
U.I. 31	- .38 (4)
U.I. 33	- .53 (2)

5. T20: Unstructured Drawings.

a. M.I. 282 Drawings: greater number of objects seen. Score total number of responses.

Reported loadings:

U.I. 16	+ .27 (7)
U.I. 17	+ .20 (8)
U.I. 21	+ .20 (8)
U.I. 22	+ .21 (8)
U.I. 32	+ .18 (3)

This variable is in Cattell's Objective-Analytic Battery for U.I. 16.

b. M.I. 336 Drawings: larger absolute number of threatening objects seen. Score the number of threatening responses (for example, see Cattell and Warburton, 1967, p. 325).

Reported loadings:

U.I. 17	+ .38 (6)
U.I. 32	+ .17

This variable is in Cattell's Objective-Analytic Battery for U.I. 17. The finding for U.I. 32 is recent evidence supplied by Charles Bolz, Laboratory of Personality Assessment and Group Analysis, University of Illinois.

6. T22 Skills: Experience and Confidence

a. M.I. 108 Skills: more confident assumption of skill in untried performance. Score by checking off all items that a person has answered in the first part of the question by marking one of the two lower levels of experience (no experience or very slight). Then, for these questions only, add up the scores on the second part of the question - level of skill - giving 4 for the highest level, and so on down to 1 for the lowest level. Express this total as a proportion of the total number of items attempted.

Reported loadings:

U.I. 21	- .15 (9)
U.I. 24	- .18 (10)
U.I. 29	+ .15 (7)
U.I. 33	- .25 (4)

b. M.I. 147 b Skills: greater breadth of experience and accomplishment. Score by adding the number of items that a person has answered in the first part of the question by marking one of the two higher levels of experience. Divide by the number of items done.

Reported loadings:

U.I. 21	- .17 (3)
U.I. 24	- .39 (1)

This variable is in Cattell's Objective-Analytic Battery for U.I. 21.

c. M.I. 325 Skills: higher total level of self-estimated experience in a range of skills. Assign scores 1 to 4 in the first part of the questions. Divide by the number of items checked.

Reported loadings:

U.I. 17	+ .27 (1)
U.I. 22	+ .44 (1)

This variable in in Cattell's Objective-Analytic Battery for U.I. 22.

7. T23 Pleasant vs Unpleasant and Past vs Future Associations.

a. M.I. 109 Pleasant vs Unpleasant: more pleasant associations. Score the number of items in sections I and IV minus the number of items in sections II and III.

Reported loadings:

U.I. 30	- .45 (1)

This variable is in Cattell's Objective-Analytic Battery for U.I. 30.

b. M.I. 110 Pleasant vs Unpleasant: more future relative to past associations. Score the number of items in sections II and IV minus the number of items in sections I and IV.

Reported loadings:

U.I. 20	+ .20 (2)
U.I. 23	- .18 (2)
U.I. 25	- .33 (1)
U.I. 26	+ .17 (2)
U.I. 30	- .33 (1)

This variable is in Cattell's Objective-Analytic Battery for U.I. 30.

8. T25 Book Preferences.

M.I. 321 Book Preferences: more restrained book preferences. Score the number of restrained book preferences.

Reported loadings:

U.I. 17	+ .44 (2)
U.I. 25	- .22 (2)

9. T44. Letter and Number Comparison.

a. M.I. 307 Comparison: faster speed (letters). Score the average line reached.

Reported loadings:

U.I. 16	+ .25 (4)
U.I. 21	+ .42 (4)
U.I. 29	+ .25 (2)

b. M.I. 308 Comparison: fast speed (numbers). Score the average line reached.

Reported loadings:

U.I. 16	+ .29 (2)
U.I. 21	+ .48 (3)

This variable is in Cattell's Objective-Analytic Battery for U.I. 21.

10. T45 Line-Length Judgment.

a. M.I. 307X Line-Length Judgment: total number done. Score total number done.

Reported loadings:

U.I. 32	+ .39

This is a new variable; information supplied by Charles Bolz of Cattell's Laboratory.

11. T49 d Letter Placement: Ideomotor Speed.

a. M.I. 6 a. Letters: faster speed. Score the average number done.

Reported loadings:

U.I. 22	+ .20 (12)
U.I. 23	+ .52 (2)
U.I. 25	+ .19 (11)
U.I. 32	(no specific figure)

This variable is in Cattell's Objective-Analytic Battery for U.I. 22. Recent work with the High School Objective-Analytic Battery suggested the presence of U.I. 32 also.[16]

b. M.I. X Letters: number correct. Score number correct.

Reported loadings:

U.I. 32	(no specific figure)

This is a recent variable suggested by Charles Bolz of Cattell's Laboratory.

12. T62 b Hesitancy: Which is More.

M.I. 737 Hesitancy: more figures checked. Score the number of figures checked.

Reported loadings:

U.I. 32	+ .20 (2)

This variable was also suggested by recent work with the High School Objective-Analytic Battery.

13. T64 Friends and Acquaintances, Parts I and II.

a. M.I. 472 Friends and Acquaintances: more acquaintances relative to friends recalled. Score number of acquaintances minus the number of friends.

Reported loadings:

U.I. 19 + .19 (3)

U.I. 26 + .18 (3)

This variable is in Cattell's Objective-Analytic Battery for U.I. 19.

b. M.I. 474 Friends and Acquaintances: more acquaintances recalled. Score the number of acquaintances recalled.

Reported loadings:

U.I. 22 + .39 (1)

U.I. 26 + .41 (1)

14. T97. Crime and Punishment, Test A, Part I.

a. M.I. 289 Crime and Punishment: faster speed of judgment. Score the number of items done.

Reported loadings:

U.I. 21 + .63 (1)

U.I. 32 (no specific figure)

This variable was suggested for U.I. 32 by recent work with the High School Objective-Analytic Battery.

b. M.I. 1169 Crime and Punishment: higher severity on noncontrite relative to contrite behavior. Score severity on noncontrite behavior minus severity on contrite behavior.

Reported loadings:

U.I. 32 + .33

This variable is suggested by Charles Bolz of Cattell's Laboratory from recent work.

15. T121 Cursive Miniature Situations (CMS).

M.I. 15 CMS: greater use of circles. Score as follows: for each row, give the number of points if the number of circles is less than seven, but give a point to each circle if the number of circles is over six. Add for all four rows.

Reported loadings:

U.I. 16	+ .16 (11)
U.I. 18	+ .30 (10)
U.I. 32	+ .17

This variable was suggested for U.I. 32 by recent work with Cattell's High School Objective-Analytic Battery.

16. T167 Preference for Successful vs Unsuccessful Tasks.

a. M.I. 1250 Preference: greater liking for successful tasks. Score mean rating in Part II.

Reported loadings:

U.I. 30	- .61 (1)

b. M.I. 1428 Preference: greater fluency concerning successful tasks. Score the number of tasks in Part I.

Reported loadings:

U.I. 30	- .62 (1)

This variable is in Cattell's Objective-Analytic Battery for U.I. 30.

17. T187 Practical Jokes.

M.I. 218 Practical Jokes: more willingness to play practical jokes and tease. Score the number of "yes" responses.

Reported loadings:

U.I. 17	+ .46 (2)
U.I. 23	+ .26 (2)

18. T361 Hard-headed Decisiveness.

M.I. 244 Decisiveness: faster speed of judgment. Score the number of questions answered.

Reported loadings:

U.I. 16	+ .24 (2)
U.I. 21	+ .60 (4)

This variable is in Cattell's Objective-Analytic Battery for U.I. 21.

19. The Lemon Drop Test

(i) A Brief History.

Recent studies by Eysenck and Eysenck (1967a, b), which were prompted by the work of Corcoran (1964) using Heron's (1956) measure of "Sociability" rather than the EPI, have found that introverts salivated more than extroverts when stimulated by drops of some kinds of lemon juice[17] applied to the tongue. This evidence has been taken to imply that extroversion is a unitary, physiologically-based trait (see also H.J. Eysenck and Eysenck, 1967; Gray, 1967; Skinner et al., 1970; and Wardell, 1974). However, Ramsey (1969) has not been able to replicate the findings, and Power and Thompson (1970) have found that people could actually simulate introversion and extroversion on the lemon drop test to a marked extent.

(ii) The Measures.

a. Trial 1: Control Salivation. Dental cotton rolls in small vials were weighed to 10^{-3} gram accuracy. The subject was asked to place a cotton roll in his mouth as demonstrated for 30 seconds. The cotton roll was removed, and reweighed with the vial. The score was the difference between the weight before and after.

b. Trial 2: Salivation with Stimulation. The subject placed a cotton roll in his mouth in the same manner as above, and then he curled his tongue out and upwards in order to receive three drops of liquid unspecified by the experimenter. The cotton roll was removed after 30 seconds, and reweighed with the vial. The score was the difference between the weight before and after.[18]

c. Difference Score. This was the Salivation with Stimulation score minus the Control Salivation score.

(iii) Interrelations.

According to Eysenck and Eysenck (1967b), "Our previous unpublished work has shown that Trial 2 scores and different scores (Trial 2 minus Trial 1) give equally good correlations with personality scores; first trial scores do not correlate with personality to any appreciable extent" (p. 46). Table V gives the intercorrelation matrix of these three scores from the present study.

TABLE V

Intercorrelations of Salivation Scores

	Trial 1	Trial 2	Difference score
Trial 1: Control	1	+ .3506	+ .1110
Trial 2: Stimulation		1	+ .9643
Difference score			1

It appears that Trial 2 scores and difference scores are, indeed, essentially equivalent. The variance in Trial 1 scores is very small.

Since all three scores together are logically dependent, the Difference measure, rather than the Trial 2 measure, was included for further analysis.

20. The Eysenck Personality Inventory (Eysenck and Eysenck, 1964)

a. Extroversion (E-I). The 1968 Form A version of the EPI was administered and scored for E-I, Sociability, and Impulsivity. This questionnaire consists of 57 items, 24 of which are used to derive an E-I score. N (Neuroticism) was also scored (see fn. 32).

b. Sociability and Impulsivity. These have been found as factors in item factor analyses of the EPI (Eysenck and Eysenck, 1963; Sparrow and Ross, 1964; Eysenck and Eysenck, 1969), but no scales had been reported for them in the literature.[19] Therefore, on the basis of reported strong loadings (particularly, Eysenck and Eysenck, 1969, p. 199f), the investigator produced scales from the 24 Extroversion items. For Sociability, these items were numbers 15, 17, 25, 27, 29, 51, and 53; and for impulsivity they were items 5, 8, 10, and 13. These sets of items are mutually exclusive, but all are extroversion items. Unfortunately, no other items were judged to have high enough loadings to justify their inclusion.

21. The 16 PF. (Cattell, Eber, and Tatsuoka, 1970)

a. 16 First-order Factors. All 16 factors were taken from the 16 PF, 1968, Form A.[20] To score the 16 factors for the factor analysis, the raw scores rather than the norm scores were used at the outset. The names of these 16 factors and brief description of each are provided in the glossary, Appendix E.

b. Four Second-order Factors. To measure the second-order factors, separate sex college student weights, given in Cattell, Eber, and Tatsuoka (1970), were applied to the separate sex college student norm scores on the primaries, as determined by the recent norm table supplement to the 1968 16 PF. The following second-order factors were thus scored:

QI Invia vs. Exvia (Chief primaries involved are A+, E+, F+, H+, and Q_2^-).

QII Adjustment vs. Anxiety (Chief primaries involved are C^-, H^-, L^+, O^+, Q_3^-, and Q_4^-).

QIII Pathemia vs. Cortertia (Tough Poise) (Chief primaries involved are A^-, I^-, and M^-, and E+, L+ for females).

QIV Subduedness vs. Independence (Chief primaries involved are E+, L+, M+, Q_1+, and Q_2+).

Further second-order factors were not included because they are still relatively poorly identified.

22. Sex. Sex was scored: 1 = male, 0 = female.

CHAPTER FIVE

ANALYSIS

The tests were all scored as indicated in the last section and the scores were punched on cards. Checking the data before and after card punching resulted in the need to drop only one male subject who failed to do the 16 PF properly. Total number of subjects was then 208, consisting of 116 males and 92 females.

The variables were first separated into those which were likely "lower-order" (all 37 test variables, "sociability" and "impulsivity" from the EPI and the 16 first-order factor variables from the 16 PF) and those which were derived or "higher-order" factor variables (i.e. Eysenck's Extroversion from the EPI and Cattell's four higher-order questionnaire factors from the 16 PF). The 53 lower-order variables were arranged in an order such that the factor pattern expected from past research was the simplest multi-factor configuration of those variables (i.e. U.I. 16 markers are followed by those for U.I. 17, U.I. 19, U.I. 21, etc.). Table VI gives the complete list of variables in this order (see pp. 71 - 74).

The Five Higher-order Factor Variables

The following initial statistics were derived for the five higher-order factor variables:

1. Hotelling's $\underline{T}^2$ test was performed over the set of five variables to test for sex differences. These differences are not expected because (a) Eysenck's EPI was designed to obviate sex differences and (b) Cattell's QI through QIV were derived from separate sex norm tables. There were no significant sex differences on these variables.

TABLE VI

List of all Test Variables (given here in the order in which they appear in all resultant matrices).

A. Lower-order Variables

(1)	1	M.I. 278/T6	faster reading tempo
(2)	2	M.I. 282/T20	more objects seen in unstructured drawings
(3)	3a	M.I. 309/T45	faster speed in line-length judgment
(4)	3	M.I. 336/T20	more threatening objects seen in unstructured drawings
(5)	4	M.I. 321/T25	more restrained book preferences
(6)	5	M.I. 218/T187	more willingness to play practical jokes
(7)	6	M.I. 30/T13	more criticisms of self relative to others
(8)	7	M.I. 147b/T22	greater breadth of experience and accomplishment
(9)	8	M.I. 472/T64	more acquaintances relative to friends recalled
(10)	9	M.I. 288/T8	faster speed of judgment
(11)	10a	M.I. 307/T44	faster speed on letter comparison
(12)	10	M.I. 308/T44	faster speed on number comparison
(13)	11	M.I. 244/T361	faster speed on judgment (decisiveness)

TABLE VI (Continued)

(14)	12a	M.I. 325/T22	higher total level of self-estimated experience in a range of skills
(15)	12	M.I. 6a/T49	more done on letter placement
(16)	13	M.I. 474/T64	more acquaintances recalled
(17)	14	M.I. 763/T13	more fluency about people's characteristics (self and others)
(18)	15	M.I. 191/T19	more considered possible for others in a given time
(19)	16	M.I. 192/T19	more considered possible for oneself in a given time
(20)	17	M.I. 109/T23	more pleasant associations
(21)	18	M.I. 110/T23	more future relative to past associations
(22)	19	M.I. 1250/T167	more liking for successful tasks
(23)	20	M.I. 1428/T167	more fluency on successful tasks
(24)	21	M.I. 316/T13	more fluency about one's own vs. other peoples characteristics
(25)	22	M.I. 307X/T45	more done on line length judgment
(26)	23a	M.I. X/T49d	higher number correct on letter placement
(27)	23	M.I. 737/T62b	more figures checked in "Which is more" (less hesitancy)

TABLE VI (Continued)

(28)	24	M.I. 289/T97	faster speed of judgment in "Crime and Punishment"
(29)	25	M.I. 1169/T97	higher severity on non-contrite relative to contrite behavior on "Crime and Punishment"
(30)	26	M.I. 15/T121	(CMS) more use of circles
(31)	27	M.I. 159c/T19	greater inaccuracy of others and self-referent time estimates
(32)	28	M.I. 108/T22	more assumption of skill in untried performance
(33)	29	Trial 1/Lemon Drop Test	more salivation when unstimulated
(34)	30	Difference score/ Lemon Drop Test	more increment in salivation when stimulated over salivation when unstimulated
(35)	31	Sex: 1 = male; 0 = female	
(36)	32	A/16PF: Affectothymia	
(37)	33	B/16PF: Intelligence	
(38)	34	C/16PF: Ego Strength	
(39)	35	E/16PF: Dominance	
(40)	36	F/16PF: Surgency	
(41)	37	G/16PF: Superego Strength	
(42)	38	H/16PF: Parmia	
(43)	39	I/16PF: Premsia	
(44)	40	L/16PF: Protension	

TABLE VI (Continued)

(45)	41	M/16PF: Autia
(46)	42	N/16PF: Shrewdness
(47)	43	O/16PF: Guilt proneness
(48)	44	Q_1/16PF: Radicalism
(49)	45	Q_2/16PF: Self-sufficiency
(50)	46	Q_3/16PF: Strength of self-sentiment
(51)	47	Q_4/16PF: Ergic Tension
(52)	48	Impulsivity/EPI: more impulsive
(53)	49	Sociability/EPI: more sociable

B. Higher-order Factor Variables

1. E/EPI: more extroversion
2. QI/16PF: more exvia vs invia
3. QII/16PF: more anxiety vs adjustment
4. QIII/16PF: more cortertia vs pathemia
5. QIV/16PF: more independence vs subduedness

Note: for more elaborate descriptions of the 16PF primary and second-order factors, see Cattell, Eber, and Tatsuoka, 1970, p. 16f and p. 116f. See Appendix E of the present paper for a Glossary of 16PF primary factors.

a. The following variables were omitted from the factor analyses because of collinearity: M.I. 309/T45, M.I. 307/T44, M.I. 325/T22, and M.I. X/T49d. Therefore, 49 of the 53 lower-order variables were factor analysed.

2. Means and standard deviations were derived both for males and females separately and combined (see Appendix C).

3. Correlations among these variables were derived both for males and females separately and combined (see Appendix C).

4. Frequency histograms for each variable were derived both for males and females separately and combined.

The 53 Lower-order Variables

The analysis of the 37 test variables and 16 first-order factor variables follows ten stages, the last of which is the intercorrelation of the factors derived from these variables with the five higher-order factor variables above.

Stage 1. Sex Differences.

Hotelling's T^2 was performed on the variables in groups of approximately 10 variables to determine the extent of sex differences in the sample. The null hypothesis, that the vector of population means does not differ between sexes, was tested for each group of variables to determine whether the variables should be mean deviated together or separately for each sex. Of course, means and standard deviations for all variables were derived both for males and females separately and combined (see Appendix C).

Stage 2. Standardizing the Data about Separate Sex Means.

Hotelling's T^2 indicated sex differences in all vectors, so the variables were deviated separately for each sex to a mean of 50 and standard deviation 10 (T-scores). This will be called the "T-score" data. In addition, the original variables, standardized for both sexes together, were also analysed through the stages which follow. This will be called the "raw-score" data.

Correlation matrices were generated for both T-score and "raw-score" data. In both instances, these matrices were derived both for males and females separately and combined (see Appendix C).

Secondly, histograms were generated for both T-score and "raw-score" variables. Again, in both instances, these histograms were derived both for males and females separately and combined.

Stage 3. Check for Collinearity.

The above correlation matrices were scanned to reveal instances where variables artifactually correlated very highly. This occurred in four cases where variables were from the same test; namely,

1. M.I. 309 and M.I. 307X (both from T45) correlated +0.83 (+0.82).
2. M.I. 6a and M.I. X (both from T49d) correlated +0.92 (+0.92).
3. M.I. 325 and M.I. 108 (both from T22) correlated +0.88 (+0.88).
4. M.I. 308 and M.I. 307 (both from T44) correlated +0.81 (+0.80).

(The number in brackets is the correlation from the "raw-score" data.)

Four variables had to be dropped from the study as a result, since their high correlations with other variables theoretically could have resulted in collinearity; that is, rank reduction of the matrix because of artifactually high correlations. If these variables had been factored, they probably would have added four test specific factors to the result, each factor removing at least two variables from contributing to other more important factors in the solution. M.I. 309 (T45), M.I. X (T49d), M.I. 325 (T22) and M.I. 307 (T44) were considered more expendable than their correlates and were dropped from the subsequent analysis. Therefore, the final factor analysis was done on 49 of the 53 lower-order variables, including the variable sex. (Thus, the five higher-order factor variables and the four lower-order test variables above were not included in the factor analysis.)

Stage 4. Image Analysis on 49 Variables.

A brief overview of Harris Image Analysis is given in Appendix B (Part a).

Harris Image Analysis was performed on both the "raw-score" and T-score data. $\underline{R}^{-1}$ was observed to be non tri-diagonal. The Harris matrix ($\underline{R}^* = \underline{S}^{-1}\ \underline{RS}^{-1}$), the eigenvalues, and the unrotated factor matrix, $\underline{A}$, for all factors with eigenvalues over one are available from the author.

Stage 5. The Number of Factors Problem.

The basic procedure used in this study was that recommended by Kaiser (1967) for Image Analysis in particular; namely, beginning with too many factors (such as Guttman's stronger lower bound, GSLB) and by means of orthogonal transformations, residualize some later columns of the factor loading matrix. This procedure is recommended in a recent review of the number of factors problem (Hakstian and Muller, 1973).

Three other procedures were also examined: Guttman's weaker lower bound (GWLB), or the "Kaiser-Guttman rule"; Cattell's (1966a) Scree test; and the Chi-square significance test from Joreskog's Unrestricted Maximum Likelihood (UML) factor analysis. These procedures involved two further factorings of the data: Principal Components and Maximum Likelihood.

a. Principal Components Analysis

This analysis was performed on both sets of data: both unrotated and normalized varimax 30-factor solutions were examined in each instance. GWLB was observed, and the eigenvalues were plotted and assessed for a "scree" by three judges before being evaluated by Dr. Cattell himself. Figures 1 and 2 give eigenvalue plots for the "raw-score" and T-score data respectively (see pp. 79 - 80).

b. Maximum Likelihood Factor Analysis

After the number of factors decision was made for this particular study, UML factor analysis was performed for a 13 factor solution. Since UML factor analysis provides both a solution that maximizes the likelihood of the sample data and also a solution that gives the best fit to the original $\underline{R}$-$\underline{U}^2$ matrix with the fewest number of factors, a significance test for the number of factors is best applied to this solution. The unrotated and normalized varimax solutions for both 13 and 24 factors were produced and the both residual correlation matrices are also available from the author.

c. Image Analysis with Residualization

The 20 factor Image solutions for "raw-score" and T-score data were subjected to normalized varimax transformations by program ORTHOMAX (Hakstian, 1970a). The degree to which factors residualized was determined by the disappearance of salients and declining factor variances.

d. Summary

Table VII (see p. 81) gives the results for both sets of data. 13 factors accounted for about 60% of the variance in the unrotated Principal Components and Image Analyses. 24 factors accounted for 80% of the variance. The UML solution with 13 factors was quite acceptable (the significance level was $p = 0.919$, well over $p = .05$), so, of course, the 24 factor solution was even better ($p = 1.000$).

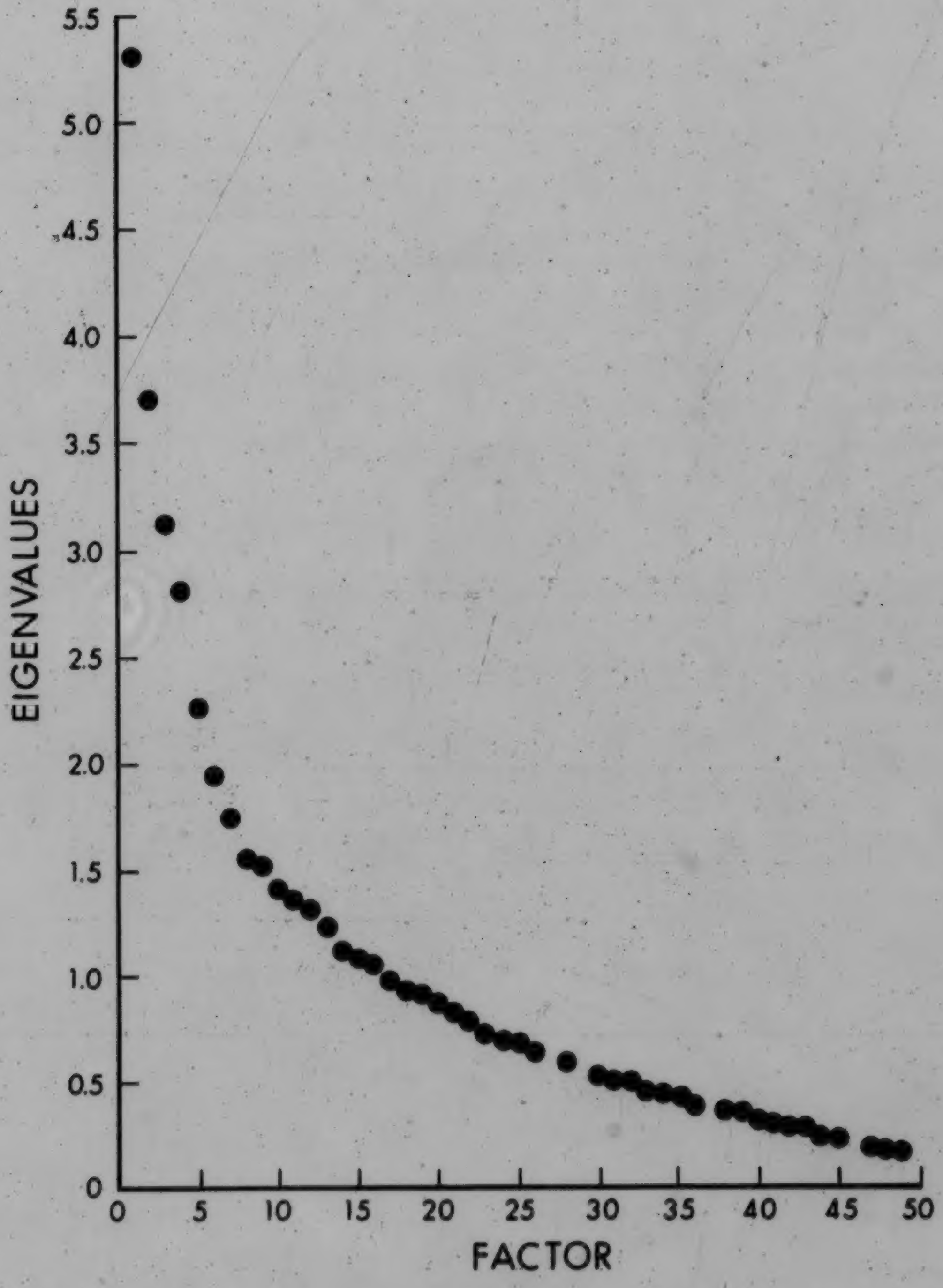

Figure 1. Eigenvalue plots for principal components analysis of "raw-score" data.

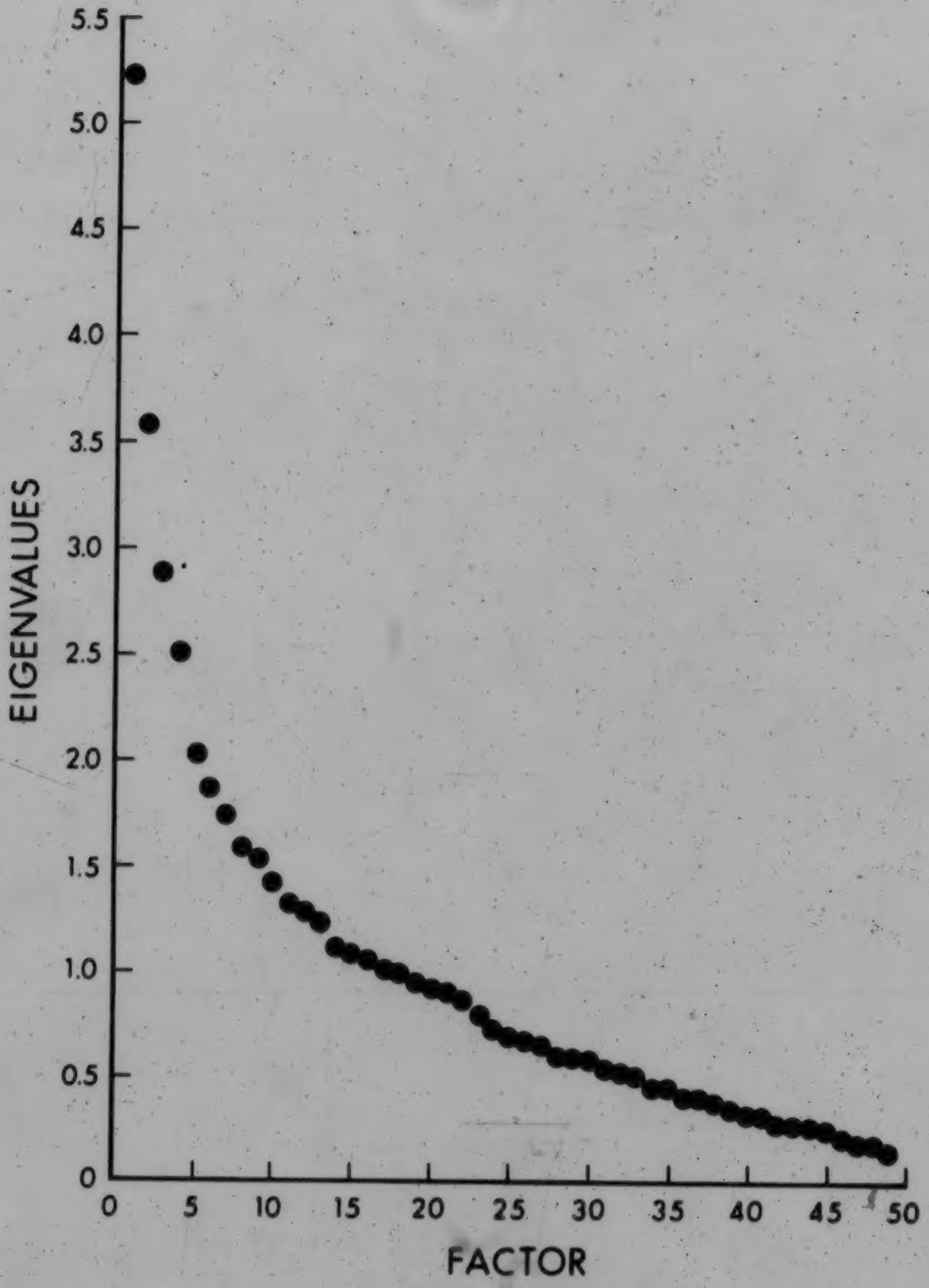

Figure 2. Eigenvalue plots for principal components analysis of T-score data.

TABLE VII

Comparison of Some Solutions to the Number of Factors Problem.

Solution	"raw-score" data	T-score data
1. GSLB from Image Analysis	29	29
2. Scree test from Principal Components Analysis		
a. Dr. Cattell	23	22-24
b. Three judges	13	13
3. GWLB from Principal Components Analysis (Kaiser-Guttman Rule)	16	17
4. Residualization from Image Analysis	13	13
5. Theory from the design of the test battery	13-14	13

This particular study utilized the more parsimonious 13 factor solution although the 24 factor solution indicated by possibly the first or second scree slope, is also examined in the results.

It may be noted that 13 factors are to be expected from the design of this study (perhaps 14 factors for the "raw-score" analysis, since a "sex" factor is likely there).

Assessment of the scree blindly by three independent factor analysts prior to Dr. Cattell's judgment suggested 13 factors in all cases. This demonstrates that there is still some degree of difficulty in the application of solutions to the number of factors problem (Hakstian and Muller, 1973).

Stage 6. Transformation.

Just as Image Analysis is becoming more utilized as a practical factor extraction policy, Harris-Kaiser transformation policies (Harris and Kaiser, 1964) are becoming more utilized at this -- the most crucial -- stage of factor analyses. In particular, work by Hakstian (1971a) has demonstrated that two "Case II" Harris-Kaiser transformations (independent cluster and $\underline{P}'\underline{P}$ proportional to $\underline{L}$) can yield best approximations to simple structure from among current widely used analytic oblique transformation procedures (including Promax, Oblimax, and Maxplane). Cattell and his associates have recently come to prefer the Harris-Kaiser procedure, recommending that the reference axis plots be examined as a check on the automatic program (Dielman, Cattell, and Wagner, 1972; see also Hakstian and Abell, 1974).

Program OBLIQUE (Hakstian, 1970b), revised for card output of the primary pattern matrix, $\underline{P}$, allows all Harris-Kaiser options and was employed here. In addition, the primary structure matrix, S, the transformation matrix, G, and the correlation matrix of the factors, L, are reproduced in Appendix D.

Both the independent clusters and the P'P proportional to L solutions were derived for both the "raw-score" and T-score data. The independent cluster solutions were not normalized, while the P'P solutions were normalized.

Stage 7. Decision as to the Best Solution.

With the above four solutions available, and with definite preference given to the T-score data, solutions were evaluated on the following criteria (Hakstian, 1971a):

(a) Hyperplane count: the number of variables for each factor with primary pattern loadings less than or equal to ± 0.10.

(b) Variable complexity: for each variable, the number of (primary pattern) loadings over ± 0.25.[21]

The results are given in Table VIII (see pg. 84).

Because of the preference for T-score data, the independent cluster solution for T-score data was accepted over the P'P proportional to L solution for "raw-score" data. The independent cluster solution also appeared to be the most interpretable and invariant of the transformations, and therefore, following the recommendations of Harris (Harris, 1967; Harris and Harris, 1971) it was favoured over the other possibilities. From Table VIII it may be seen that 69% of the variables are in the hyperplane for this solution. Cattell and his associates (Hundleby, Pawlik, and Cattell, 1965) state that usually transformation to 60 to 75% of the variables in the hyperplane is "unimprovable" (p. 21).

TABLE VIII

Comparison of Harris-Kaiser Oblique Solutions

A = Case II, Independent Cluster Solution

B = Case II, P'P Proportional to L Solution

Criterion	"raw-score" analysis		T-score analysis	
	A	B	A	B
1. Hyperplane count:	66.1%	70.6%	68.8%	71.1%
2. Variable complexity				
(i) number of variables with complexity greater than one:	13	9	9	8
(ii) number of variables with complexity less than one:	1	5	6	10

An extant subroutine written by Bryce Schurr was modified by the author and Linda Irons of the Psychology Department to produce plots of the primary pattern and reference structure matrices for the accepted solution. All pair-wise obliquely-plotted primary pattern plots and all pair-wise orthogonally-plotted reference structure plots for 13 factors were generated by the author. The latter plots were examined by Drs. Royce and Kawash for visual shifts. Both investigators expressed their approval of the solution without further graphic transformations.

The derivation of the reference structure matrix, $\underline{V}$, the transformation matrix, $\underline{\Lambda}$, the transformation matrix, $\underline{D}$, and the matrix of correlations between the reference vectors, $\underline{\Psi}$, is given in Appendix B (Part b).

Stage 8. Final Factor Result.

The 13 factor independent cluster solution for the T-score data constitutes the final factor result for interpretive purposes. (For matrices $\underline{P}$, $\underline{S}$, and $\underline{L}$, see Appendix D.)

Stage 9. Calculation of Image Factor Scores.

Hakstian (1971b) has outlined formulas to derive Image Factor scores. The present procedure used the following formula from that paper:

$$X = ZS^{-1}WD^{-1/2}T$$

where $\underline{X}$, $\underline{N}$ persons by $\underline{r}$ factors, is the matrix of factor scores; $\underline{Z}$, $\underline{N}$ persons by $\underline{n}$ variables, is the matrix of z-scores on the data variables[22]; $\underline{S}^2$, $\underline{n}$ by $\underline{n}$, is the diagonal matrix of variances of the anti-images from the Image analysis; $\underline{W}$, $\underline{n}$ by $\underline{r}$, is the matrix of eigenvectors; and $\underline{D}$, $\underline{r}$ by $\underline{r}$, is the diagonal matrix of eigenvalues from the original Image analysis. $\underline{T}$ is our $\underline{G}$ matrix, an $\underline{r}$ by $\underline{r}$ transformation matrix from the original unrotated matrix $\underline{A}$ to the primary structure matrix, $\underline{S}$. Since $\underline{S} = \underline{AG}$, then

$$T = G = (A'A)^{-1}A'S$$

The calculation of Image factor scores could be checked for exactness since

$$G'G = L$$

and

$$\frac{X'X}{N} = L$$

where L has already been obtained from the transformation program OBLIQUE.

Stage 10. Correlations of Factor Scores with Higher-order Data Variables.

The final step in this part of the analysis was to generate the matrix of Pearson product-moment correlations between the factor scores obtained in Stage 9 above with the scores on the five higher-order factor variables. This matrix was derived for both sexes separately and combined (see Appendix D).

Final Stage. Higher-order Factor Analyses.

Two different kinds of higher-order analysis were performed. The first, the Schmid-Leiman procedure (Schmid and Leiman, 1957), involves a complete hierarchical analysis, followed by orthogonalization of the factors at each order with respect to those at lower orders. In theory, this has the conceptual advantage of indicating the degree of influence of factors at any one order with the influence of factors at higher orders partialled out. The second procedure, originating with Hendrikson and White (1966) and Cattell and White (Cattell, 1966b), involves factor analyses at each level without orthogonalization with respect to other levels. In the Hendrickson-White procedure, factors are transformed to simple structure with respect to the original data variables, while in the Cattell-White procedure, factors are transformed to simple structure with respect to the factors at the next lower level of factoring. According to Cattell (1966b, 1973a), this has the conceptual merit of determining factors in terms of the most simple pattern of direct influence on the lower-order factors, although this need not result in simple structure on the original data variables.

Schmid-Leiman higher-order factor analyses were performed from the original T-score data and from the present 13 factor Independent Cluster solution on T-score data. In both cases, the available factor analysis package specified principal axis analysis with iteration on the communalities, followed by Varimax and Promax (to the fourth power) transformations. In the former analysis, 13 factors were specified for the first-order structure by the author, recognizing that the resultant factors would only be approximations to the 13 Independent Cluster factors. In the latter analysis, the first-order factors were specified to be the 13 Independent Cluster factors, and the analysis was continued from that basis.

Hendrickson-White hierarchical analyses were also performed from the original T-score data and from the present 13 factor Independent Cluster solution on T-score data. The available program this time utilized the principal components procedure, followed by Varimax and Promax transformations in terms of the original data variables. The hierarchical analysis from the original data, therefore, must be recognized as an approximation to the Independent Cluster solution at the first-order, not only because different transformations were necessitated, but also because of the conceptual inadequacy of component analysis itself (Wardell, 1976c). The hierarchical analysis from the 13 first-order factor solution, of course, results in second-order factors that are transformed to simple structure (Promax) with respect to the first-order factors (Cattell-White) rather than the original data variables (Hendrickson-White).

These four higher-order analyses, therefore, are only approximations to the most appropriate higher-order analyses for these data. These analyses are reported with some caution in the results to follow.

Comparison of the final Image Analysis with Common factor Analyses.

The 13 factor Image analysis of T-score data, using unnormalized independent cluster rotation, was compared and checked against both 13 and 24 factor principal axis solutions on the same data, using exactly the same rotational procedure. Communalities were estimated by iteration, and factor scores were estimated by the regression method. Pearson product-moment correlations were generated between the 13 Image factors and 13 principal axis factors (see Table IX) and between the 13 Image factors and 24 principal axis factors (see Table X). In both tables, the principal axis factors are arranged in order to show the matchings along the main diagonal. Those factors in the 24 factor solution that did not match with any of the Image factors are omitted. Only correlations greater than ±.30 are shown in the tables.

Both tables show very clear matches between all the factors generated through Image analysis and those generated using the Common Factor model. All diagonal correlations are at least ±.95 when the two 13-factor solutions are compared, and all except one are above ±.80 when the 13 and 24-factor solutions are compared. These results indicate that the choice of the Image model and the choice of 13 rather than 24 factors do not jeopardize the comparability and invariance of the results with those that would have been achieved using the more traditional model or the larger number of factors.

TABLE IX

Correlations of factor scores from Image analysis with 13 factor Principal axis solution

Principal Axis	Image Factor												
Factor (13)	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	XIII
I	-.99		-.40			-.49	.43			-.30			
XIII		-.99			-.32		.43					.36	-.59
VII	-.44		-.99								-.31		
V				.97									
VI					.99		-.31						
IV	.51					.98	-.33			.31			
VIII	.43	-.34			.41	.33	-.98			.46			.50
XI						-.32		-.95					
IX									.99				
X							.33			-.98			
III											-.98		
XII						.42						.95	-.33
II		-.59					-.40	.32		.34		-.42	.99

TABLE X

Correlations of factor scores from Image analysis with 24 factor Principal axis solution

Principal Axis	Image Factor												
Factor (24)	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	XIII
I	-.96		-.53			-.70	.45					-.33	
II		-.92			.39		-.47					-.31	.67
IX			-.92							-.33			
V				.91									
VI					-.92		.41						
XI			-.50			.47		.34					
VIII	-.43					-.33	.93			-.48			-.31
XXIII	-.38		-.40				.36	-.83					-.38
IV									.83				
X										-.88			
III						.42					-.95		
XII												-.80	
XV		-.64					-.30					-.47	.95

PART III

RESULTS AND DISCUSSION

If extroversion - introversion is to be restored as a useful concept in personality theory it has to be re-distilled as a functionally unitary personality source trait, disclad of the superposed characteristics which do not stand empirical verification.
- Hundleby, Pawlik and Cattell, 1965, p. 298.

CHAPTER SIX

RESULTS

Results will be dealt with in five divisions:

(1) the intercorrelation matrix of the higher-order factor variables,

(2) intercorrelations between higher and lower-order variables,

(3) the interpretation of factors from the factor analysis of lower-order variables,

(4) the intercorrelation matrix of the resultant factors with the higher-order factor variables, and

(5) the interpretation of the higher-order analyses.

Intercorrelations of Five Higher-order Factor Variables

The means and standard deviations for the five higher-order factor variables are given in Appendix C for both sexes combined and separately.

Table XI on the following page gives the intercorrelation matrices of higher-order variables for both sexes combined, and each sex separately.

The correlation of Eysenck's E-I with Cattell's QI (Exvia) is somewhat lower than that reported in other studies (+ .67 vs. about .73). It is higher for males (.73) than females (.63). The correlation of both E-I and QI with Cortertia (QIII) is noticeable (.41 and .36), particularly for females (.59, .53) rather than males (.23, .22). However, the pattern of correlation is somewhat different for E-I and QI in that Eysenck's E-I correlates more with Anxiety (QII) for females (-.29 vs. -.16 for males), while Cattell's QI correlates more with Anxiety (QII) for males (-.29 vs. -.20 for females). Independence (QIV) is more highly correlated with QI for males than females (.33 vs. .13).

TABLE XI

Intercorrelations between Higher-order Variables

	E-I	QI	QII	QIII	QIV
Combined (N = 208)					
E-I		.669a	-.221a	.405a	.246a
QI			-.251a	.364a	.245a
QII				-.099	-.365a
QIII					.313a
QIV					
Males (N = 116)					
E-I		.725a	-.158	.255b	.243b
QI			-.289b	.221b	.334a
QII				-.091	-.411a
QIII					.319a
QIV					
Females (N = 92)					
E-I		.625a	-.291b	.586a	.258b
QI			-.199	.531a	.127
QII				-.115	-.291b
QIII					.319a
QIV					

[a] significant at the $p \leq .001$ level

[b] significant at the $p \leq .01$ level

The intercorrelations of Cattell's higher-order variables are comparable to those given by Cattell, Eber and Tatsuoka (1970, p. 122f) based on previous research. While generally this study finds higher correlations, the association between Exvia (QI) and Cortertia (QIII) for females and between Exvia (QI) and Independence (QIV) for males are substantiated. It appears that high extroversion is more aligned with high "cortical alertness" for women, but with high independence for men. Theoretically, this may indicate that constitutional factors are more influential in the ontogenesis of extroversion for females, while environmental experience *per se* is more influential for males.

Intercorrelation between Five Higher and 53 Lower-order Variables

The means and standard deviations for the 53 lower-order variables are given in Appendix C for both sexes combined and separately. Of course, these are prior to deviating the variables about separate sex means (as T-scores).

The complete intercorrelation matrix between the 53 lower-order variables in T-score form and the 5 higher-order variables is given in Appendix C.[23]

After four variables were eliminated from the 53x53 matrices, they were factor analysed as described in the previous section. However, it was of interest to examine the correlations of the lower-order variables -- particularly the objective test variables -- with the higher-order factor variables, particularly Eysenck's E-I and Cattell's QI (Exvia).

(i) Objective Test Correlates of Higher-order Factor Variables.

Table XII (see pp. 97 - 98 following) gives the results of this search for objective test correlates of extroversion variables. The correlations given here are for the T-score data (i.e., the lower-order variables are deviated for each sex separately) although the "raw-score" data are very similar.

It may be seen that the correlations in Table XII are quite stable across extroversion measures and sexes.[24]

With regard to Eysenck's E-I, one variable is strangely missing from this list: Eysenck's own lemon drop test. The correlations between E-I and the lemon drop test variables are given in Table XIII (see p. 99). It may be recalled from the last section that the Trial 2 variable correlated very highly with the Difference score. The correlation of the Trial 2 score with E-I is negligible (-.03).

In terms of Eysenck's own findings, these results are disappointing. From the present study, the lemon drop test does not appear to have any substantial relationship to either Cattell's or Eysenck's questionnaire measures of extroversion (the highest correlation is -.15 between both lemon drop test variables and Eysenck's E-I for females). Factor analytic results to be reported below substantiate this finding. It will be shown that the difference score on the lemon drop test does not load on the extroversion factor (which correlates highly with Cattell's and Eysenck's questionnaire measures of extroversion), but rather loads on a higher-order "inhibition" factor marked by extroversion and other lower-order factors.

TABLE XII

Objective Test Correlates of Higher-order Extroversion Variables. (Numbers correspond to the numbers from Table VI. For particulars on each variable, refer to Table VI.)

VARIABLE			CORRELATION[a]	
NO.		NAME	E-I (Extroversion)	QI (Exvia)
(6)	5	More willingness to	.210b	.226c
		play practical jokes	.167	.240b
			.253b	.213
(14)	12*	Higher total level of	.269c	.378c
		self-estimated experience	.264b	.411c
		in a range of skills	.276b	.343c
(16)	13	More acquaintances	.293c	.264c
		recalled	.407c	.321c
			.178	.200
(17)	14	More fluency about	.271c	.311c
		people's characteristics	.294c	.328c
		(self and others)	.249b	.294b
(18)	15	More considered possible	.256c	.216c
		for others in a given	.269b	.259b
		time	.244b	.173
(20)	17	More pleasant associations	.229c	.222c
			.178	.216
			.284b	.228

TABLE XII (Continued)

VARIABLE		CORRELATION[a]	
NO.	NAME	E-I (Extroversion)	QI (Exvia)
(22) 19	More liking for successful tasks	.221c	.145
		.201	.103
		.242b	.188
(23) 20	More fluency on successful tasks	.184b	.244c
		.332c	.319c
		.040	.151
(32) 28	More assumption of skill in untried performance	.230c	.309c
		.192	.333c
		.270b	.284b

---

[a] The first row give correlations for combined sexes; the second row is for males and the third for females. (Taken from T-score data.)

[b] significant at the $p \leqslant .01$ level

[c] significant at the $p \leqslant .001$ level

TABLE XIII

Correlations of the Lemon Drop test with Eysenck's E-I (Extroversion). (Numbers correspond to the numbers from Table VI.)

VARIABLE		CORRELATION[a]	
No.	Name	Raw-score data	T-score data
		E-I	E-I
(33)	29: Trial 1: more	-.055	-.070
	salivation when un-	.001	.001
	stimulated	-.155	-.155
(34)	30: Difference score:	-.013	-.024
	more increment in	.098	.098
	salivation when	-.147	-.147
	stimulated over		
	salivation when		
	unstimulated		

[a] The first row gives the correlations for combined sexes; the second row is for males and the third for females.

Another relevant fact emerges: Trial 1 scores and Difference scores correlate +.18, -.02 and +.42 for combined sexes, males and females respectively. There is an important sex difference in the operation of these variables in the present study. It is also noticeable that F (surgency), a primary involved in QI (Exvia) and QVIII ("good upbringing"), correlated with the Trial 1 score for females only (r = -.21).

With regard to Cattell's QI (Exvia), it may be seen (Table IV) that only one of its objective test correlates is a marker for U.I. 32 (Exvia). On the other hand, none of the correlations is inconsistent with Cattell's definition of extroversion as it appears in the questionnaire domain.

(ii) Questionnaire Corelates of Higher-order Factor Variables.

Table XIV (see pp. 101-102 following) gives the results of the corresponding search for questionnaire correlates of extroversion variables. The correlations given here are for the T-score data again, although the "raw-score" data are very similar. (Appendix E is provided as a glossary of 16PF source traits.)

Again, it may be seen that these correlations are quite stable across extroversion measures and across sexes. It is likely that the correlations with E-I are generally lower because of the lower reliability of the E-I scale compared to QI.

TABLE XIV

Questionnaire Correlates of Higher-order Extroversion Variables. (Numbers correspond to the numbers from Table VI. For particulars on each variable, refer to Table VI or Appendix E.)

VARIABLE			CORRELATION[a]	
NO.		NAME	E-I (Extroversion)	QI (Exvia)
(36)	32	A: Affectothymia	.285c	.499c
			.256b	.405c
			.316b	.607c
(38)	34	C: Ego Strength	.228c	.301c
			.164	.356c
			.293b	.254
(39)	35	E: Dominance	.395c	.421c
			.392c	.461c
			.396c	.391c
(40)	36	F: Surgency	.668c	.765c
			.641c	.819c
			.703c	.708c
(42)	38	H: Parmia	.668c	.765c
			.635c	.831c
			.703c	.697c
(47)	43	O: Guilt Proneness	-.222c	-.318c
			-.166	-.332c
			-.275b	-.305b

TABLE XIV (Continued)

VARIABLE			CORRELATION[a]	
	NO.	NAME	E-I (Extroversion)	QI (Exvia)
(49)	45	Q_2: Self-sufficiency	-.279c	-.459c
			-.368c	-.526c
			-.186	-.390c
(50)	46	Q_3: Strength of Self-sentiment	-.209b	-.130
			-.244b	-.177
			-.173	-.081
(52)	48	Impulsivity	.466c	.130
			.288b	.018
			.645c	.250
(53)	49	Sociability	.803c	.671c
			.792c	.705c
			.817c	.636c

[a] The first row gives correlations for combined sexes, the second row is for males and the third for females. (Taken from T-score data.)

[b] significant at the $p \leq .01$ level

[c] significant at the $p \leq .001$ level

One must expect high correlations between Cattell's QI (Exvia) and those lower-order variables from which it is calculated (A, E, F, H, and Q_2^-), but it also correlates with two variables from which QII (Anxiety) is calculated; namely, C (Ego Strength) and O (Low Guilt Proneness).

Eysenck's E-I follows this pattern with somewhat lower correlations throughout, except that Q_3^- (Strength of the Self-sentiment) is also correlated with it. Q_3^- is a major marker for QVIII (Superego strength vs. lack of self sentiment or "good moral upbringing") in Q-data, and may be associated with U.I. 17, general inhibition, in T-data. At this stage, one might speculate as Adcock (1965) and others have done, that Eysenck's measure of extroversion is conceptually and empirically more highly related not only to QIII, Cortertia, but also to QVIII, Superego strength (or General Inhibition), than Cattell's Exvia.

One would also expect high correlations between Eysenck's E-I (Extroversion) and those lower-order variables which are measured by some of the same items; namely, Impulsivity and Sociability. While this is true, Impulsivity appears to correlate with E-I more for females than males. Cattell's QI (Exvia) correlates with Sociability, but not Impulsivity (except minimally for females).

Two tentative conclusions emerge at this stage of analysis. One is that there may be different lines of ontogenesis of extroversion in males and females. With females, extroversion is correlated with "impulsivity", physiological measures and a largely constitutional factor, Cortertia. With males, there may be stronger correlation between extroversion, measures of quick assertiveness and more environmental factors, like Independence. However, these results may also be accounted for by heterogeneity of variance across sexes on these test variables and factors. Secondly, there is some evidence that Eysenck's measure of extroversion is correlated with other higher-order factors such as QIII, Cortertia and QVIII, Superego strength more than Cattell's exvia. These factors have been linked with cortical arousal and general inhibition respectively, concepts that Eysenck has used to establish biological bases for extroversion. Because of the theoretical divergence of Cattell and Eysenck with respect to the number and nature of second-order factors, with Cattell (1973a, pp. 185ff) demanding that QIII, U.I. 22, QVIII, and U.I. 17 not be mistaken for QI (U.I. 32), Exvia, empirical discrepancies between E-I and QI show up more vividly in females for whom these other higher-order factors -- or lower-order factors that they influence -- are apparently involved in extroversion in some way. The question remains whether these other higher-order factors are replicable along with extroversion, and how they might be involved with extroversion itself.

Interpretation of Factors

Appendix D gives the matrix results of the Image analysis on T-score data with a Harris-Kaiser independent cluster transformation on 13 factors. Reported are the primary factor pattern matrix, P, the primary factor structure matrix, S, and the intercorrelation matrix of the primary axes, L. Other matrices, such as the unrotated factor matrix, A, and the reference vector structure matrix, V, are available from the author.

A visual comparison of salients across four solutions revealed essentially the same factors in all cases. The corresponding P'P proportional to L transformation reversed the order of factors IV and VI. The solutions with "raw-score" data revealed, as expected, a "sex" factor (III), followed by factors III, IV, V, IX, VII, VIII, X, XI, VI, and XIII from the solution to be reported. Factor XII dropped out of these 13 factor solutions.

All variables with (primary pattern) loadings over ±.25 are reported below. Variables are presented in the order of the size of their loadings. With each objective test variable, the factors for which it is a putative marker are given in brackets (an asterisk denotes the variable as a member of the Objective-Analytic Battery for the factor so designated).

Factor I. QI: EXTROVERSION. (Q)

As shown in the table on the following page, most important here are the presence of Cattell's first-order markers for QI (Exvia): A+, F+, H+, and Q_2^-; and also the presence of the Sociability variable from the EPI. Objective test markers do not allow the identification of any particular factor from previous work.[25] Therefore, the factor is labelled (Q) -- a replication in the questionnaire domain only.

Factor I. QI: EXTROVERSION. (Q)

Variable Number	T/M.I.	Variable Name	Loading
36		F (high Surgency)	.84
49		Sociability	.63
27	19/159c	Greater accuracy on other and self-referent time estimates (17, 19, 33)	-.53
38		H (high Parmia)	.43
5	187/218	More willingness to play practical jokes (17, 23)	.38
45		Q_2 (low Self-sufficiency)	-.33
29		Trial 1: less salivation when unstimulated	-.30
19	167/1250	More liking for successful tasks (30)	.28
17	23/109	More pleasant associations (30*)	.27
32		A (high Affectothymia)	.27
33		B (high Intelligence)	.27

Factor II. U.I. 21: EXUBERANCE. (T)

This factor is reflected (i.e., all signs reversed from its original appearance).

Variable Number	T/M.I.	Variable Name	Loading
24	97/289	Faster speed of judgment in "Crime and Punishment" (21, 32)	.58
9	8/288	Faster speed of judgment (17, 21*)	.51
11	361/244	Faster speed of judgment (decisiveness) (16, 19, 21*)	.40
18	23/110	More future relative to past associations (30*, 25, 20, 26, 23)	.28
29		Trial 1: less control salivation	-.27

Because of the three major salients, this factor (see table above) is identified with Cattell's U.I. 21 in the objective test (T) domain. The particularly "socio-orientedness" fluency measures -- M.I. 763 and M.I. 316 (variables 14 and 21 respectively) -- do not appear here.

Factor III. QII: ANXIETY. (Q)

This factor is reflected (i.e., all signs reversed) from its original appearance.

Variable Number	T/M.I.	Variable Name	Loading
34		C (low Ego Stength)	-.67
43		O (high Guilt Proneness)	.65
47		Q_4 (high Ergic Tension)	.64
40		L (high Protension)	.41
46		Q_3 (low Strength of Self-sentiment)	-.32
5	187/218	More willingness to play practical jokes (17, 23)	.28

This pattern is very consistently the QII (Anxiety) pattern found by Dr. Cattell in the questionnaire (Q) realm. Markers for QII are C-, H-, L+, O+, Q_3-, and Q_4+, all of which are represented here (H loads -.21).

Factor IV and Factor V are considered relatively "narrow" or even test specific factors, and are mentioned at the end of this section.

Factor VI. QIV: INDEPENDENCE. (Q)

This factor (Factor VI, p. 105) is identified by the presence of E+, L+, and Q_1+, all markers for Cattell's QIV (Independence) in the questionnaire realm. The objective test markers are inconsistent in identifying a corresponding U.I. factor although one prominent marker for U.I. 19 (Independence) is present.

Factor VI. (Cont'd)

Variable Number	T/M.I.	Variable Name	Loading
35		E (more Dominance)	.69
40		L (more Protension)	.39
44		Q_1 (more Radicalism)	.36
27	19/159c	Less accuracy of other and self-reference time estimates (17, 19, 33)	.29
38		H (more Parmia)	.25

Factor VII. U.I. 32: EXVIA. (T)

This factor is reflected (i.e., all signs reversed) from its original appearance.

Variable Number	T/M.I.	Variable Name	Loading
14	13/763	More fluency about people's characteristics (self and others) (28*, 32, 34, 24)	.63
20	167/1428	More fluency on successful tasks (30*)	.55
5	187/218	More willingness to play practical jokes (17, 23)	.26

Factor VII. (Continued)

Variable Number	T/M.I.	Variable Name	Loading
30		Difference score: more increment in salivation when stimulated over salivation when unstimulated (Eysenck's E-I)	.26
2	20/282	More objects seen in unstructured drawings (16*, 22, 21, 17, 32)	.25

This factor identification is not definite. It is based on first, the presence of four markers for U.I. 32 with loadings over ±.20 (T49, M.I. 6a and T97, M.I. 1169 load -.23 and +.20 respectively) and, second, the correlations of this factor with Factor I (Extroversion) (+.45) and Eysenck's E-I (Extroversion) (+.36) and Cattell's QI (Exvia) (+.48). This factor correlates positively with fluency about acquaintances (Factor V, r = +.40), and it also correlates with Factor X which is marked by two U.I. 32 variables. The identification of this factor with U.I. 32 is, therefore, also partly on the basis that U.I. 32 is largely indicated by fluency on socially relevant topics.[26] It may be seen that Eysenck's Difference score variable from the Lemon drop test is a marker for this factor, but in the opposite direction to Eysenck's prediction.

Factor VIII. U.I. 28: SELF-ASSUREDNESS vs. ASTHENIA. (T)

Variable Number	T/M.I.	Variable Name	Loading
7	22/147b	Greater breadth of experience and accomplishment (24, 21*)	.43
16	19/192	More considered possible for self in a given time (28, 33, 31, 21, 26)	.36
15	19/191	More considered possible for others in a given time (28*)	.35
40		L (high Protension)	.26

This factor is tentatively identified by the presence of two markers, both unfortunately from the same test. However, the interpretation of Self-assuredness vs. Asthenia in terms of high psycho-physical momentum, security and self-confidence is quite compatible with the marker from T22 also. These characteristics are also associated with L+ in Q-data; that is, suspiciousness, jealousy, paranoia, and more generally, the tendency to project inner tensions onto outer situations. The self-assured individual is more likely to see fault in his associates and situations than in himself. Therefore, the association between U.I. 28 in T-data and L (Protension) in Q-data that was reported by Hundleby et al. (1965) from previous studies is substantiated here. In fact, this could be an instance where two first-order factors are identifiable across the two domains, as an exception to the rule that first-orders in T-data correspond to second-orders in Q-data.

Factor IX. QVI: SUBJECTIVE IDEALISM vs. DETACHED REALISM. (Q)

Variable Number	T/M.I.	Variable Name	Loading
41		M (more Autia)	.56
33		B (more Intelligence)	.31
45		Q_2 (more Self-sufficiency)	.28

This factor is a fairly close replication of QVI in questionnaire data, entitled "Prodigal subjective idealism vs. detached realism" and marked by M+ (Autia), Q_1+ (Radicalism), and Q_2+ (Self-sufficiency) (Cattell, 1973a,p. 187). It is interpreted as a seclusive, imaginative and idealistic concern and interest in subjective goals, rather than a cool, practical acceptance of existing realities.

Factor X is considered relatively "narrow" or test specific and is mentioned at the end of this section.

Factor XI. QVIII: GOOD UPBRINGING. (Q)

Variable Number	T/M.I.	Variable Name	Loading
37		G (more Superego Strength)	.57
46		Q_3 (more Strength of the Self-sentiment)	.44
48		Impulsivity	-.27

This factor is also a fairly close replication of a second-order factor in Q-data, QVIII, which Cattell (1973) has recently renamed "good upbringing", rather than "superego strength vs. lack of self-sentiment" (Cattell, Eber and Tatsuoka, 1970), a name which readily identified its important markers, G+ (Superego strength) and Q_3+ (Self-sentiment), in addition to F- (Desurgency).[27] Cattell has found QVIII to be quite distinct from QI, Exvia, at the second-order level, and, in fact, they share only one primary, F (Surgency). He has called QVIII a "behavior control" factor (Cattell, 1971, p. 369f) because of its influence on "superego values and social values of the self-sentiment", resulting in "increased general restraint and thus reduced surgency and dominance."

As stated in the introduction, evidence has recently shown that U.I. 17 (Inhibition) may be the identical trait to QVIII in T-data (Wardell and Yeudall, 1976). However, no conventional U.I. 17 markers appear on the present factor. Still, it is significant that two of the four objective test variables loading over ±.15 are markers for the U.I. 17 factor found in a psychopathological group by Wardell and Yeudall (1976), a factor that correlated highly with G+ and Q_3+.

This factor substantiates Carrigan's (1960) and Adcock's (1965) proposals that the "impulsiveness" aspect of extroversion could appear as a factor marked by G- and Q_3-. Since this factor is not correlated with extroversion (Factor I from this study) or with Cattell's Exvia (QI), and only slightly with Eysenck's E-I ($r = -.15$), it is quite clear that the factor is distinct from extroversion, whether measured by the EPI or the 16 PF. Adcock's further view that markers for U.I. 17 would appear here is supported if the criterion for a marker is reduced from ±.25 to ±.15. No objective tests appear with loadings greater than ±.25 but two out of the four greater than ±.15 are U.I. 17 markers in other studies. The problem, as Cattell and Klein (1975) state, is that U.I. 17 has a tendency to change in terms of marker variables with different populations. In fact, one might expect "inhibition" to be expressed in different behaviors depending on the subjects and the situation. This makes any identification of U.I. 17 across populations rather tentative until the boundary conditions can be clearly specified.

Factor XII. QIII: CORTERTIA. (Q)

This factor (Factor XII, p. 111), which dropped out of the 13 factor "raw-score" factor analyses (replaced by a "sex" factor), is identified with Cattell's QIII, Cortertia, in Q-data because of the prominence of the primary I-, Premsia. The other primaries that mark QIII, M- and A-, show up with loadings below +.25.[28]

Factor XII is reflected (i.e., all signs reversed) from its original appearance.

Variable Number	T/M.I.	Variable Name	Loading
39		I (less Premsia)	-.55
4	25/321	More restrained book preferences (17, 25)	-.26

In the most complete recent statement of second-order patterns (Cattell, 1973a, p. 116), I, M and A load -.73, -.47, and -.25 respectively. No U.I. 22 (Cortertia) markers from objective tests appear on this factor although it is interesting that the Difference score on the lemon drop test has a loading of +.18. Since this test is notoriously unreliable, this indicates that perhaps an important part of its reliable variance may be attributed to a trait of cortical arousal. QIII scored from the 16 PF (using the weights in Cattell, Eber and Tatsuoka, 1970) correlates +.30 with scores on this factor. While this is a fairly low correlation, it might be accounted for by the fact that the markers for Cortertia are somewhat different for males and females (with E and L showing up for females), and therefore, the present factor is a closer approximation to QIII for males than females. Evidence to be cited in the next section shows a correlation of 0.53 with QIII for males and 0.02 for females.

Factor XIII. U.I. 16: ASSERTIVENESS. (T)

Variable Number	T/M.I.	Variable Name	Loading
10	44/308	Faster speed on number comparison (16, 21*)	.73
22	45/307X	Total number done on line length judgment (32)	.53
12	49/6a	Number done on letter placement (23, 22, 32, 25)	.48
23	62b/737	More figures checked in "Which is More" (less hesitancy) (32)	.45
4	25/321	More restrained book preferences (17, 25)	.29
29		Trial I: more salivation when unstimulated	.28

While this factor would seem to be a good U.I. 32 identification, two facts make this a weak claim. First, variables 22, 12 and 23 -- all the U.I. 32 markers -- were suggested from recent research with the High School Objective-Analytic Battery as good markers for U.I. 32. Second, this factor does not correlate with extroversion in any instances (correlations with Factor I, Eysenck's E-I, and Cattell's Exvia are .10, .13, and .16 respectively). Rather than loading variables of "socio-orientedness" (c.f. Factor VII above), this factor loads variables of speed, effectiveness and self-assertion. It appears that perhaps the factor identification with the High School Battery was incorrect, or that there is an important change in the manifestation of U.I. 32 since adolescence. Although this factor correlates +.45 with the previously identified U.I. 32 (Factor VII), it also correlates +.62 with Factor II (Exuberance), and +.43 with Factor XII (Cortertia). Considering all loadings over ±.15, three markers for U.I. 16 exist in the pattern for Factor XIII.

Factors IV, V, and X are considered relatively "narrow" or even "test doublet" factors. Factor IV is a result of the high correlation between variables from T13, possibly indicating the degree of fluency about oneself. Factor V is marked by variables from T64, possibly indicating the degree of fluency about acquaintances. Factor X is marked by variables specific to T20, indicating the degree of fluency on unstructured drawings. These factors are given below with their relationships to the factors mentioned above.

Factor IV. T13: TEST DOUBLET (Fluency about oneself).

Variable Number	T/M.I.	Variable Name	Loading
6	13/30	More criticism of self relative to others (19*)	.70
21	13/316	More fluency about own vs. other people's characteristics (28, 32*, 25, 16)	.61

Two high and related loadings distinctly greater than other loadings make this factor appear to be a test doublet.

Factor V. T64: TEST DOUBLET (Fluency about acquaintances)

Variable Number	T/M.I.	Variable Name	Loading
8	64/472	More acquaintances relative to friends (19*, 26)	.70
13	64/474	More acquaintances recalled (26, 22)	.67

For the same reason, this factor may be presumed to be a "swollen specific" (Cattell et al., 1971) measure of fluency about others and, as such, it correlates with U.I. 32 (Factor VII, r = .40).

Factor X. T20: TEST DOUBLET (Fluency on unstructured drawings).

Variable Number	T/M.I.	Variable Name	Loading
33	20/336	Number of threatening objects seen (17*, 32)	.57
2	20/282	Number of objects seen in unstructured drawings (16*, 22, 21 17, 32)	.45

This factor, like Factor V, appears to be test specific at the outset. Like Factor V above, since this factor correlates with Factor VII (+.42), it is also interpreted as a particular measure of externally-oriented fluency relevant to U.I. 32.

The three factors isolated as test doublets are expected to drop out as factors in the higher-order analyses to be reported below.

Intercorrelations of Factors and Five Higher-order Factor Variables

Table XV (see following page) gives the matrices of correlations between the factors resulting from this study and the higher-order traits (Eysenck's E-I, and Cattell's QI, QII, QIII, and QIV). These matrices are presented for both sexes combined and separately. The matrix of primary factor correlations, L, in Appendix D, is expanded to include the correlation of these factors with the higher-order factor variables.

Factor I (Extroversion) is very highly and consistently correlated with Eysenck's E-I and Cattell's QI (Exvia): correlations are .82 and .85 respectively. Extroversion is also consistently correlated with low anxiety for both sexes (QII-), and high cortertia for females (QIII+).

Factor II (Exuberance) has no significant correlate among the higher-order factor variables.

Factor III (Anxiety) is correlated +.95 with Cattell's QII (Anxiety). Anxiety is also consistently correlated with introversion and low independence for males (QIV-).

Factor IV (Fluency about Oneself) has no consistent correlate among the higher-order factor variables.

TABLE XV

Intercorrelations of Factors with Higher-order Variables[a]

Factor

	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	XIII
E-I	.83	-.01	-.27	.06	.26	.55	.35	.20	-.27	.27	-.15	-.19	.13
	.80	.02	-.22	-.00	.40	.53	.43	.26	-.21	.33	-.15	-.07	.17
	.84	-.04	-.32	.11	.10	.57	.28	.15	-.32	.22	-.16	-.30	.09
QI	.85	.01	-.35	-.03	.25	.53	.47	.14	-.25	.20	.04	-.21	.16
	.91	.02	-.41	-.12	.31	.60	.51	.20	-.15	.31	-.07	-.20	.11
	.78	.00	-.29	.08	.19	.47	.43	.07	-.36	.09	.16	-.22	.21
QII	-.38	.05	.95	.15	-.11	-.17	-.21	-.17	-.25	-.11	-.24	.07	-.04
	-.35	-.02	.94	.23	-.17	-.14	-.20	-.25	-.31	-.18	-.30	.05	-.13
	-.41	.15	.95	.05	-.02	-.23	-.22	-.06	-.18	-.03	-.15	.10	.06
QIII	.37	.19	-.10	.05	.07	.48	.15	.20	-.09	.12	-.30	.30	.10
	.21	.26	-.10	.03	.06	.29	.10	.13	.16	.02	.44	.53	.14
	.56	.09	-.10	.06	.09	.71	.23	.28	-.41	.23	-.11	.02	.04
QIV	.29	.19	-.30	-.11	.16	.76	.17	.33	.50	.22	-.37	-.04	-.02
	.30	.20	-.37	-.16	.13	.75	-.20	.38	.51	.27	-.27	.02	.08
	.28	.18	-.22	-.05	.20	.79	.13	.27	.49	.14	-.52	-.11	-.16

[a] First row gives the correlations for both sexes combined; second row is for males; third row is for females.

Factor V (Fluency about Acquaintances) is somewhat correlated with extroversion, particularly for males.

Factor VI (Independence) is highly correlated with Cattell's QIV (Independence) (.76). In addition, it is quite highly correlated with E-I (.55) and QI+ (.53). It is also correlated with QIII (Cortertia) for females (.71).

Factor VII (U.I. 32: Exvia), as already reported, correlates +.35 and +.47 with E-I and QI respectively. Other correlations are low.

Factor VIII (Speed and Breadth of Experience) correlates somewhat with QIV (Independence). Other correlations are low: speed and breadth of experience correlates with extroversion for males.

Factor IX (Idealism) correlates with QIV (Independence) 0.50, as has been mentioned previously. Other correlations are low, although there is a tendency for female introverts to be more "idealistic" or, at least, "internally autonomous" in thought, as opposed to being concerned with outer practical matters (as Cattell puts it, a "Martha" rather than a "Mary").

Factor X (Fluency on Unstructured Drawings) has relatively small correlations with both extroversion factors (E-I and QI).

Factor XI (Good Upbringing) has a more complex pattern of correlations. Although these correlations are low, it appears that good upbringing is associated with introversion as measured by Eysenck's E-I. If Factor XI is identifiable with U.I. 17 (General Inhibition), then this fits with Eysenck's theory that introverts are more inhibited (and less impulsive) behaviorally. On the other hand, good upbringing is somewhat correlated with extroversion (Cattell's exvia) for females only. Again, if the factor is identifiable with U.I. 17, this means that female extroverts are somewhat more inhibited -- and less impulsive -- than introverts (in direct contrast to Eysenck). Since female extroverts are generally high on Cortertia, one explanation could be that female extroverts, being relatively alert, realistic, and thought-oriented, develop characteristics of "good moral upbringing" (G+, Q_3+) that inhibit impulsive, fluctuant behavior. There is no corresponding relationship between inhibition, cortertia, and extroversion for males.

Factor XII (Cortertia) is correlated with QIII (Cortertia) for males ($r = .53$), but not for females ($r = .02$). As previously stated, since the identification of QIII is somewhat different between sexes, Factor XII is clearly biased towards the markers for males. Correlations with other higher-order variables are low, and will be ignored here.

Factor XIII (Assertiveness) does not correlate significantly, or in a consistent fashion, with any higher-order factor variables.

Higher-order Factor Analyses

As previously mentioned, the Schmid-Leiman and Hendrickson-White hierarchical solutions were calculated from the 49 original data variables. Since the former procedure initially involves finding factors and rotating them with respect to the factors at the next lower level rather than always with respect to the original data variables, it is comparable to the Cattell-White hierarchical procedure before the factors at each order are then orthogonalized with respect to the factors at other levels. This Cattell-White analysis, and the Hendrickson-White and Schmid-Leiman analyses are given for comparative purposes in Appendix D.

The Cattell-White and Hendrickson-White first-order solutions could be visually compared to the solution reported above. (Extant hierarchical computer programs did not allow factor score calculations so the factors were not directly compared by correlating them with those reported above.) In both cases, most first-order factors were readily comparable with the above factors, although these analyses used the Common Factor (principal axes) and Component (principal components) Models respectively (rather than the Image Model), and Varimax followed by Promax rotations (rather than Harris-Kaiser transformations). From earlier comparisons of these models (see chapter five and fn. 30), it is possible to state that the empirical differences that do appear must be largely a result of differences in transformations rather than factor extraction policies. This supports the view that careful transformations are required in order to establish factor invariance. One factor in particular was not identified at the first-order, Factor XI (QVIII, Good upbringing) and it appears that Factor VIII (U. I. 28, Self-assuredness) split into two factors to take its place in both solutions.

The first-order factors were tentatively identified as follows:

	Final Solution	Hendrickson-White	Cattell-White
1.	QI: Exvia	U.I. 21: Exuberance	QI: Exvia
2.	U.I. 21: Exuberance	QI: Exvia	U.I. 21: Exuberance
3.	QII: Anxiety	QII: Anxiety	QII: Anxiety

	Final Solution	Hendrickson-White	Cattell-White
4.	Fluency about oneself	QIV: Independence	Fluency about others
5.	Fluency about others	Fluency about oneself	QIV: Independence
6.	QIV: Independence	Fuency about others	Fluency about oneself
7.	U.I. 32: Exvia	U.I. 32: Exvia	U.I. 32: Exvia
8.	U.I. 28: Self-assuredness	Fluency on drawings	QVI: Idealism
9.	QVI: Idealism	U.I. 28: Self-assuredness	Fluency on drawings
10.	Fluency on drawings	QVI: Idealism	U.I. 28: Self-assuredness
11.	QVIII: Good up-bringing	QIII: Cortertia	QIII: Cortertia
12.	QIII: Cortertia	U.I. 28: Self-assuredness	U.I. 28: Self-assuredness
13.	U.I. 16: Assertiveness	U.I. 16: Assertiveness	U.I. 16: Assertiveness

Five second-order factors and two third-order factors were extracted for both hierarchical solutions, using the Kaiser-Guttman rule for the number of factors applied to the resultant eigenvalues in each solution. These factors were rotated to approximate simple structure with respect to the next lower-order factors in the Cattell-White procedure, and with respect to the original data variables in the Hendrickson-White procedure.

In the Hendrickson-White procedure, the factors could be interpreted from the loadings of the original data variables in the final Promax rotation. Some of these factors could be tentatively identified with those reviewed by Cattell (1975) as invariant third-order factors in Q-data (see Appendix D for loadings):

Second-order factors:

1. Extroversion: three U.I. 32 (exvia) markers (variables 2, 14, 24) and four QI (exvia) markers (A+, E+, F+, H+).
2. Efficient responsiveness (Cattell's Q_γ): combines markers for QIII (cortertia) and U.I. 16 (assertiveness).
3. Adjustment (Cattell's Q_β, "favored status"): combines markers for QII (low anxiety) and QVI (idealism).
4. Good upbringing: reappearance of lower-order factor for QVIII, with G+, Q_3+, and impulsivity markers.
5. Uninterpreted.

Third-order factors:

α. Social inhibition: similar to second-order factor 1 above.

β. General inhibition: four markers for QVIII, good upbringing, and three markers for U.I. 17 (inhibition).

In the Cattell-White procedure, the factors could only be interpreted in terms of the loadings of the factors at the lower-order (see Appendix D). Since these factors are only approximations to those reported earlier, these results will only be mentioned briefly. (Factors have been reflected where necessary.)

Second-order factors:

1. Efficient responsiveness (Cattell's Q_γ): Cortertia (QIII) loads +1.02. Exuberance (U.I. 21), loading +.45, is a possible match in T-data (c.f. Factor 2 above).

2. Assertiveness (U.I. 16) loads +0.96. Independence (QIV) loading +.58, possibly matches with U.I. 16 in T-data, rather than with U.I. 19 (Independence), as usually hypothesized.
3. Adjustment, with low anxiety and high self-assurance (U.I. 28) (c.f. Factor 3 above).
4. Uninterpreted (c.f. Factor 5 above).
5. Extroversion, loading QI (exvia) +0.98 and U.I. 32 (exvia) +0.29 (c.f. Factor 1 above).

Third-order factors:

α. Inhibition (Cattell's Qα) loading all second-order factors except Factor 3.

β. Adjustment

For the purpose of the present study, these solutions agree on the convergence of U.I. 32 (exvia) and QI (exvia) from T and Q-data, respectively. They also agree on the invariance of four third-order factors from Q-data previously outlined by Cattell (1975) and designated Qα, Qβ, Qγ and Qδ. Although "good upbringing" did not appear as a first-order factor in either solution, it could be detected at the second-order through the projections of the original data variables on second-order factors in the Hendrickson-White solution. It is noticeable that objective test markers for U.I. 17, inhibition, loaded on this factor.

When the factors at each level are orthogonalized with respect to factors at the lower levels to produce a Schmid-Leiman solution, the results (Appendix D) show the loadings of the variables on the lower-order factors to be generally smaller than on the higher-order factors. Still, the first-order factors resemble those from the Cattell-White solution reported above.

Third-order factors (Schmid-Leiman):

α. Inhibition (Cattell's Qα)

β. Uninterpreted residual

Second-order factors:

1. Efficient responsiveness (Cattell's Qγ)
2. QVIII: Good upbringing
3. Uninterpreted residual
4. Uninterpreted singlet
5. Extroversion

First-order factors:

I. QI: Exvia

II. U.I. 21: Exuberance

III. QII: Anxiety

IV. Fluency about others

V. QIV: Independence

VI. Fluency about oneself

VII. U.I. 32: Exvia

VIII. QVI: Idealism

IX. Fluency on drawings

X. Doublet (U.I. 28: Self assuredness?)

XI. QIII: Cortertia

XII. Doublet (U.I. 28: Self-assuredness?)

XIII. Residual (U.I. 16: Assertiveness?)

Most noticeable is the fact that almost all factors strongly resemble those found in the corresponding Cattell-White analysis, with the exception that QVIII, good upbringing, reappears at the second-order as it did in the Hendrickson-White solution. Third-order Factor α loads F+ and H+

along with six U.I. 32 markers. Second-order Factor 5 also loads F+ and H+, along with Exvia primaries, A+, Q_2-, and two U.I. 32 markers. First-order Factor I, with F+ and H+ as markers, is identified with Factor I in the original factor analysis and the Cattell-White approximation. Therefore, the Schmid-Leiman results appear to indicate that the third-order inhibition factor is a major influence on objective test variables in the present study, while the lower-order extroversion factors show higher loadings with questionnaire markers for exvia-invia. This accords with Cattell's view (see Chapter two) that factors based on questionnaires are generally at a lower stratum than those based on objective tests because of the relative sampling specificity of the former, particularly with respect to social behavior. As a result, first-order objective test factors such as U.I. 32 and second-order questionnaire factors such as QI often appear as "refraction factors" (Cattell, 1961) in a cross-media factor study.[29]

The three hierarchical solutions mentioned above are based on first-order solutions which are somewhat different from the final solution reported previously. Therefore, while the results are useful and comparable in certain respects, they are not precise higher-order analyses from the present results. In particular, they omit first-order Factor XI (Good upbringing) from the final solution although this factor did reappear at the second order in both the Hendrickson-White and Schmid-Leiman results. Therefore, hierarchical solutions were also initiated from the final first-order solution, rather than the original data variables. As a result, the second-order Hendrickson-White and Cattell-White solutions are almost exactly alike.

Briefly, they show the following structure:

Second-order factors (Hendrickson-White loadings are given with Cattell-White loadings in parentheses):

Factor 1: Extroversion

Factor I.	Extroversion (QI)	.94	(.94)
III.	Anxiety (QII)	-.51	(-.47)
V.	Fluency about others	.46	(.33)
VI.	Independence (QIV)	.72	(.72)
VII.	Exvia (U.I. 32)	.63	(.53)
IX.	Idealism (QVI)	.31	(.28)
X.	Fluency on drawings	.43	(.30)
XII.	Cortertia (QIII)	-.41	(-.33)

Factor 2: Efficient responsiveness (Cattell's Qγ)

Factor II.	Exuberance (U.I. 21)	.78	(.68)
VII.	Exvia (U.I. 32)	.40	(.40)
X.	Fluency on drawings	.31	(.27)
XII.	Cortertia	.71	(.56)
XIII.	Assertiveness (U.I. 16)	.88	(.97)

Factor 3: Emancipation (Cattell's Qδ)

Factor III.	Anxiety (QII)	-.43	(-.42)
VI.	Independence (QIV)	-.56	(-.46)
XI.	Good upbringing (QVIII)	.93	(.84)

Factor 4: Adjustment (Cattell's Qβ, "favored status")

Factor III.	Anxiety (QII)	-.33	(-.37)
IV.	Fluency about self	.76	(.30)
IX.	Idealism	.86	(.76)

Factor 5: Uninterpreted

Factor IV.	Fluency about self	.38	(.62)
VIII.	Self-assuredness (U.I. 28)	.79	(.28)
IX.	Idealism (QVI)	.30	(.27)
XII.	Cortertia (QIII)	.32	(.22)

It can be seen that these factors are very similar to those previously found in the second-order Hendrickson-White analysis from the original data variables. They are also similar to the earlier Cattell-White analysis, except that the latter obviously omits Factor 3.

At the third-order, the two factors from the Hendrickson-White solution are shown with the projections of the first-order factors.

Third-order factors (Hendrickson-White):

Factor α: Social inhibition

Factor I.	Extroversion (QI)	-.44
III.	Anxiety (QII)	.93
IV.	Fluency about self	.53
V.	Fluency about others	-.41
VII.	Exvia (U.I. 32)	-.34
IX.	Idealism (QVI)	-.38
XI.	Good upbringing (QVIII)	-.50

Factor β: General inhibition

Factor II.	Exuberance (U.I. 21)	-.70
III.	Anxiety (QII)	-.50
VI.	Independence (QIV)	-.42
VII.	Exvia (U.I. 32)	-.45
X.	Fluency on drawings	-.61
XI.	Good upbringing (QVIII)	.74
XII.	Cortertia (QIII)	-.32
XIII.	Assertiveness (U.I. 16)	-.47

In the Cattell-White solution, three factors are given with the projections of the second-order factors.

Third-order factors (Cattell-White):

Factor α:	Social inhibition	
Factor 1.	Extroversion	-.57
2.	Efficient responsiveness	.47
4.	Adjustment	-.59
Factor β:	General inhibition	
Factor 3.	Good upbringing or inhibition	.90
Factor γ:	Uninterpreted	
Factor 5.	Uninterpreted	.86

When the factors at each level are orthogonalized with respect to those at lower levels, the resultant Schmid-Leiman solution closely resembles the previously reported Cattell-White and Hendrickson-White solutions.

Third-order factors (Schmid-Leiman):

Factor α:	Social inhibition	
Factor I.	Extroversion (QI)	-.34
II.	Exuberance (U.I. 21)	-.34
III.	Anxiety (QII)	.39
V.	Fluency about others	-.31
VI.	Independence (QIV)	-.37
VII.	Exvia (U.I. 32)	-.42
VIII.	Self-assuredness (U.I. 28)	-.35
XIII.	Assertiveness (U.I. 16)	-.42

Factor β: General inhibition		
Factor II.	Exuberance (U.I. 21)	-.30
III.	Anxiety (QII)	-.42
VI.	Independence (QIV)	-.36
XI.	Good upbringing (QVIII)	.70
Factor γ: Uninterpreted		
Factor IV.	Fluency about self	.46
XII.	Cortertia (QIII)	.30

Second-order factors:

Factor 1: Extroversion		
Factor I.	Extroversion (QI)	.74
III.	Anxiety (QII)	-.37
VI.	Independence (QIV)	.56
VII.	Exvia (U.I. 32)	.42
Factor 2: Efficient Responsiveness (Cattell's Qγ)		
Factor II.	Exuberance (U.I. 21)	.57
VII.	Exvia (U.I. 32)	.34
XII.	Cortertia (QIII)	.47
XIII.	Assertiveness (U.I. 16)	.82
Factor 3: Emancipation (Cattell's Qδ)		
Factor XI.	Good upbringing (QVIII)	.38
Factor 4: Adjustment (Cattell's Qβ, "favored status")		
Factor III.	Anxiety (QII)	-.30
IX.	Idealism (QVI)	.61
Factor 5: Uninterpreted		
Factor IV.	Fluency about self	.31

Again, the results from Schmid-Leiman orthogonalization do not appear to greatly improve upon other findings.

In summary, the hierarchical solutions from 49 variables approximated the 13 factor first-order structure previously reported except Factor XI, good upbringing, was not replicated at the first-order. The higher-order structures are summarized below:

Second-order factors:

	Hendrickson-White		Cattell-White
1.	Extroversion	1.	Qγ, Responsiveness
2.	Qγ, Responsiveness	2.	Uninterpreted
3.	Qβ, Adjustment	3.	Qβ, Adjustment
4.	QVIII, Good upbringing	4.	Uninterpreted
5.	Uninterpreted	5.	Extroversion

Third-order factors:

α.	Social inhibition	α.	Qα, Inhibition
β.	General inhibition	β.	Adjustment

The Schmid-Leiman analysis resembled the Cattell-White findings, except that QVIII, good upbringing, reappeared as in the Hendrickson-White results. A fourth-order factor appeared in the Hendrickson-White analysis, loading three U.I. 17 markers, four U.I. 32 markers, the Difference score from the lemon-drop test, and Impulsivity (see Appendix D). Therefore, this factor may be quite similar to Cattell's Qα, Inhibition, which is also found at the third-order in the corresponding Cattell-White and Schmid-Leiman analyses.

The hierarchical solutions from the original 13 Image factors resulted in the following higher-order factors:

Second-order factors:

Hendrickson-White, Cattell-White, and Schmid-Leiman

1. Extroversion
2. Qγ, Responsiveness
3. Qδ, Emancipation
4. Qβ, Adjustment
5. Uninterpreted

Third-order factors:

Hendrickson-White	Cattell-White	Schmid-Leiman
α. Social inhibition	α. Social inhibition	α. Social inhibition
β. General inhibition	β. General inhibition	β. General inhibition
	γ. Uninterpreted	γ. Uninterpreted

The third-order social and general inhibition factors correlated +.45 and +.20 in the Hendrickson-White and Cattell-White analyses respectively. The resultant fourth-order factor in the Hendrickson-White analyses loaded extroversion (QI and U.I. 32), independence (QIV), idealism (QVI), and good upbringing (QVIII), making it a clear replication of Cattell's Qα, Inhibition (see Appendix D). Fourth-order factors were not generated by the Cattell-White analysis.

The higher-order "adjustment" factor, largely marked by QII, anxiety, is similar to Cattell's Qβ, "favored status". In support of Carrigan's (1960) hypothesis, extroversion (i.e., her "social extroversion") and low social inhibition are positively associated with adjustment, while poor upbringing (i.e., her "lack of self control") and low general inhibition are negatively associated with adjustment.

CHAPTER SEVEN

DISCUSSION

The functional unity of extroversion is substantiated in the present study, both in Q and T-data. In Q-data, extroversion emerges as a replicable source trait at the second-order level, with the traditional primary markers such as A+ (Affectothymia), Q_2- (Group orientation), and particularly F+ (Surgency) and H+ (Adventurousness). In T-data, extroversion emerges in a less well defined manner~~,~~ through objective test measures of externally or socially-oriented fluency and "other-directedness". While extroversion emerged as two distinquishable factors in each domain, the factors themselves converged at the higher order. Therefore, it is possible to conceive of these lower-order factors as "refraction factors" (Cattell, 1961); that is, factors representing the same source trait, but appearing as separate factors at the lower-order because they are "refractions" of that same functional unity through the assessment devices of two distinct media. This is the interpretation of factors I and VII in the present study, and it is further substantiated by each higher-order factor analysis. The first factor to appear at the first-order in both the Cattell-White and Schmid-Leiman solutions, and the second factor to appear at the first-order in the Hendrickson-White solution (closely resembling the first factor at the second-order) is marked by exvia primaries F and H and about five objective test markers for U.I. 32 (exvia). When the Cattell-White and Hendrickson-White solutions are applied to the first-order factors from the present study, factor I (QI, exvia) and factor VII (U.I. 32, exvia) load together on a single higher-order factor. All three hierarchical analyses support the contention that extroversion is best conceived of as a second-order factor in Q-data and first-order factor in T-data; i.e., a first-order factor in the present study.

Most of the other first-order factors in the present study are clear replications of factors previously established in second-order analyses of the 16 PF primaries and first-order analyses of objective tests. For example, Horn's carefully rotated second-order factors from the 16 PF are clearly replicated in the present study: protected emotional sensitivity (I) is the major marker for Pathemia vs. Cortertia, radical independent attitudes (Q_1) coupled with dominance (E) mark Independence, and low self sufficiency (Q_2^-) and high autism (M) mark Idealism. While Independence and Idealism share markers, they are clearly distinct factors in Horn's careful rotations and in the present study.

In T-data, factors U.I. 16 (assertiveness), U.I. 21 (exuberance), U.I. 28 (self-assuredness), and U.I. 32 (exvia) are identified in the present study, although in some cases there are differences in the markers from those in previous studies.[30] In particular, the concept of extroversion may have certain complicating features according to the present results. First, it may change in terms of T-data markers from adolescence through adulthood. If the factor identification of U.I. 32 in the present study is accurate, it may be that, at younger ages, U.I. 32 is marked by variables that measure quickness, energy, and assertiveness (U.I. 16) in adulthood.

Second, a number of sources in the present results show a clear sex difference in the interrelationships of extroversion with other traits. If earlier developmental research on these other traits can be assimulated with these results, this indicates that the natural history of extroversion may be more dependent on earlier constitutional influences in females, and developmental experiences in males. In general, cortertia is correlated with extroversion (and independence) for females, while independence alone is correlated with extroversion for males. Extrapolating, it is possible to suggest that mental alertness, practicality and realistic, efficient thinking are natural precursors of independence and extroversion in females, while social experiences and encouragements are more important precursors of independence and extroversion in males. This point of view is acknowledged in Cattell's "spiral interaction" theory of extroversion, in which primary traits, combining constitutional and environmental influences, interact under social molding pressures to produce a higher-order trait that acts as a functional unity itself; namely, extroversion. It is further suggested here that the constitutional influences are more important in this process for females than for males. In fact, there is some evidence to believe that constitutionally-oriented measures, such as Eysenck's lemon-drop test, insofar as they are effective at all, are better measures of the second-order extroversion factor for females.[31]

There are other findings in the present study which show extroversion to be distinct from other factors, for both sexes.

In particular, extroversion is clearly distinct from another higher-order factor, a replication of Cattell's QVIII, "Good upbringing", which may be identifiable with U.I. 17, Inhibition, from T-data. The lower-order markers of G, Q_3 and F clearly show that this factor is a replication of the factor Carrigan (1960) labelled "Lack of self control" in her review of the "two dimensions" of extroversion. In fact, from the present findings, this factor is not an aspect of extroversion at all, while the factor that Carrigan (1960) and others have variously called "Social extroversion" or "Sociability" is typically a replication of extroversion itself as measured by both Eysenck and Cattell (e.g., Sells et al., 1970, 1971; Eysenck and Eysenck, 1969; Howarth and Browne, 1971a, 1972; Browne, 1971).

As the factor appears in the present study, inhibition (or "good upbringing") is indicated by higher superego strength (G+), more self-sufficiency (Q_3+), and less surgency (F-). The opposite end of the dimension is associated with lack of self control or impulsivity from EPI. Thus, it is slightly correlated with extroversion from Eysenck's EPI, but it is interesting to note that it is slightly correlated in the opposite direction with exvia from Cattell's 16 PF for females. One could suggest that some exviant females may actually be less impulsive and more inhibited (i.e., higher superego strength, more self-sufficiency) than inviant females, and that the contrary findings with the EPI may be largely a result of the extroversion scale sharing items with the impulsivity scale.

According to the present results, extroversion is also clearly distinguished as a factor from Cortertia (QIII) and Independence (QIV) in Q-data, and Assertiveness (U.I. 16), Exuberance (U.I. 21), and Self-assuredness (U.I. 28) in T-data.

Carrigan's (1960) suggestion that adjustment would be related positively to "Social extroversion" and negatively to "Lack of self control" is substantiated in the hierarchical analyses reported above. In addition, extroverts were less anxious (QII, $r \simeq -.40$) and less neurotic (N, $r \simeq -.25$) than introverts. Impulsive individuals, on the other hand, were somewhat more neurotic ($r \simeq +.23$), and more anxious ($r \simeq +.24$).[32] The relationship of anxiety and neuroticism to extroversion is more significant for Cattell's QI (exvia) than Eysenck's E-I measure. This accords with previous findings with both measures. Of all the anxiety primaries, those most highly correlated with extroversion appear to be higher ego strength (C+) and less guilt proneness (O-).

In introductory remarks, the dilemma was posed that Eysenck and Cattell had quite different theoretical perspectives on the nature and functioning of extroversion, while designing operationalizations that were quite similar empirically, both emphasizing social orientation, or what Jung considered an "externally-oriented" attitude. (Murray's terms "extraception - intraception" may be the most adequate descriptions.) While Cattell has been very explicit in his theoretical identification with Jung and Murray (e.g., Cattell's adoption of the term exvia, or "outer-living"), Eysenck has developed the concept of extroversion along different lines, particularly emphasizing traditional American learning theory and Pavlovian physiological work (e.g., Gray 1967, 1970).

The present results concur with earlier findings by Hundleby and Connor (1968) that the questionnaire measures of extroversion developed by Eysenck and Cattell are fairly highly correlated, although the correlation appears to be higher for males than females (Hundleby and Connor used a male sample). Table XVI (pp. 141-142) presents a comparison of the constructs in terms of their relationships to other factors from the present study.

First, it is clear that the pattern of relationships is quite similar for the two constructs. However, there is a tendency for Eysenck's E-I to be more highly correlated with Cortertia (Factor XII and Cattell's QIII) and Good upbringing (Factor XI and Cattell's QVIII). On the other hand, the objective test factor, U.I. 32 (Factor VII, exvia) correlates more highly with Cattell's QI, exvia. According to Cattell's (1975) view, this clearly supports the contention that Eysenck's extroversion scale is actually a second-order construct, but, "because of the short-cut taken by omitting primaries [is] not as factor true as is necessary." In contrast, Barton and Cattell (1975) have recently produced a measure of extroversion and other secondaries (the Central Trait-State Kit) which provides direct scores for these secondaries based on their relationship to primary factors.

While Eysenck's questionnaire measure of extroversion may not be as "factor true" as Cattell's in terms of Cattell's other first and second-order factors here, it is possible that Eysenck's

TABLE XVI

Relation to Eysenck's E-I and Cattell's QI to the Factors in this Study.[a]

	Factor I (Extroversion)	E-I (Extroversion)	QI (Exvia)
1. Anxiety			
a. Factor III: Anxiety (QII)	-.46b	-.27b	-.35b
	-.44b	-.22	-.41b
	-.48b	-.32c	-.29c
b. Cattell's QII: Anxiety	-.38b	-.22	-.25b
	-.35b	-.16	-.29c
	-.42b	-.29c	-.20
2. Cortertia			
a. Factor XII: Cortertia (QIII)	.28b	.19c	.21c
	.20	.07	.20
	.36b	.30c	.22
b. Cattell's QIII: Cortertia	.37b	.41b	.36b
	.21	.23	.22
	.56b	.59b	.53b
3. Independence			
a. Factor VI: Independence	.55b	.55b	.53b
	.53b	.53b	.60b
	.57b	.57b	.47b

TABLE XVI (Continued)

	Factor I (Extroversion)	E-I (Extroversion)	QI (Exvia)
b. Cattell's QIV: Independence	.29b	.25b	.25b
	.30b	.24c	.33b
	.28c	.26c	.13
4. Factor IX: Idealism (QVI)	-.17c	-.27b	-.25b
	-.13	-.21	-.15
	-.23	-.32c	-.36b
5. Factor XI: Good upbringing (QVIII)	-.06	-.15	.04
	-.08	-.15	-.07
	-.04	-.15	.15
6. Factor VII: Exvia (U.I. 32)	.45b	.35b	.47b
	.53b	.43b	.51b
	.35b	.28c	.43b

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[a] The first row gives correlations for combined sexes, the second row is for males, and the third for females.

[b] Significant at the $p \leq .001$ level.

[c] Significant at the $p \leq .01$ level.

conceptualization of extroversion belongs at a higher-order than Cattell's exvia. If the present second-order extroversion factor can be identified with Carrigan's "Social extroversion", then it is clear that Eysenck considers his construct of extroversion to be a higher-order factor, marked by both "Social extroversion" or "Sociability" and "Lack of self control" or "Impulsivity" at the lower order. The former factor is clearly identifiable with the QI, extroversion (Factor I) in the present study, while the latter factor is clearly identifiable with QVIII, good upbringing (Factor XI) and its likely match in T-data, U.I. 17, inhibition. Sociability and impulsivity scales from the EPI load on Factor I and Factor XI respectively.

Eysenck has typically found that his sociability and impulsivity factors from the EPI correlate about +.47 (e.g. Eysenck and Eysenck, 1963). While the factors of extroversion and good upbringing in the present study are orthogonal, the respective higher-order factors of Social inhibition and General inhibition correlate +.45 in the Hendrickson-White hierarchical analysis. Thus, they load on a single higher-order factor, as Eysenck has consistently found for sociability and impulsivity (Eysenck and Eysenck, 1969). Cattell's QI, exvia, is uncorrelated with QVIII, good upbringing ($r = +.15$ for females), and Eysenck's E-I is only slightly correlated with it ($r = -.15$ for both sexes).

As reported earlier, Carrigan (1960), Adcock (1965) and Farley and Farley (1970) have suggested that Eysenck's concept of extroversion is conceptually similar to the concept of "Lack of self control", General inhibition, or "Impulsivity." Although the present study did not show a strong empirical relationship between measures of

E-I and these concepts, it is suggested here that Eysenck's concept of extroversion may actually be conceptually similar to a higher-order factor shared by both "Lack of self control", General inhibition, or "Impulsivity" and Cattell's own factorial concept of extroversion. It is emphasized that this suggestion is speculative, since the present hierarchical analyses were limited in terms of subjects, variables and procedures (e.g., Promax transformations).

However, it is interesting that in Cattell's (1975) recently reported third-order factor analyses of Q-data, the first replicated factor, Qα, combined the second-order factors of extroversion (QI), independence (QIV) and good upbringing (QVIII), and was interpreted as possibly a "temperamental genetic factor" of inhibition, perhaps linked to the strength of the nervous system, a Pavlovian construct that Eysenck himself has linked to his concept of extroversion (e.g., Eysenck, 1966).

Extroversion, as Cattell has conceived it, is quite similar to the insightful "depth" conceptualizations of Carl Jung, elaborated by Murray and others. As such, it emphasizes an external vs. internal orientation (extraception vs. intraception) that has a complex basis in temperament and experience. The best objective tests for this factor emphasized wide ranging experience, fluency about people, fluency about success and, for males, number of acquaintances listed. A higher-order factor, if it accurately represents Eysenck's concept of extroversion, may be more closely related to Eysenck's specific genetical and physiological factors and concepts of traditional learning theory. The problem becomes an empirical one, since much better measuring devices are clearly needed if this higher-order factor is to be replicated and studied more thoroughly. More generally, there is a prevalent need for more "independent verification" (Howarth, 1972) between the measures adopted by Eysenck and his associates as a result of careful experimentation in perception, learning, and psychophysiology and those found by Cattell and his associates through extensive factor analytic studies. For example, if this higher-order factor is replicable, many of the empirical disagreements with aspects of Eysenck's theory of extroversion may be largely a result of the lack of concordance between the theoretical construct and the EPI or other measuring devices. Improvements in instrumentation are obviously crucial to the further advancement of multivariate personality theory (Cattell, 1973b). On the other hand, criticisms that Cattell's source traits are not extensively verified outside of factor analyses could be met by the establishment of further congruences with the experimental work of Eysenck and his colleagues.

For example, in more recent work, Gray (1970, 1972, 1973) has suggested an elaboration of Eysenck's concept of extroversion that essentially splits the concept into two lower-order components resembling sociability and impulsivity. While Gray develops these components in terms of traditional learning theory, he does not explicitly show their relationship to other replicated first and second-order factors, or to factors that may be replicable at the third-order level. It may well turn out, for example, Gray's concept of "sociability" in terms of inhibitory mechanisms in the "Stop system" is an elaboration of the nature and functioning of a primary trait such as H, Parmia vs. threctia, or F, Surgency.

As another example, although earlier work by Eysenck (1956b) emphasized the hereditary component in his extroversion concept, recent work by Eaves and Eysenck (1975) has been interpreted by the authors to demonstrate a substantial environmental determination to extroversion, as measured by the EPI. This accords with Cattell's views of the possible etiology of exvia mentioned earlier (see Cattell, 1973a). On the other hand, Cattell's suggestion that the third-order factor upon which exvia loads in Q-data may have a "temperamental genetic basis" is more in accord with Eysenck's biological theory of extroversion.

Recent work by Royce (1973) has been concerned with the appropriate hierarchical structuring of affective traits, particularly those of Eysenck and Cattell. This effort has had to contend with a great deal of conflicting and confusing results and factor interpretations, particularly with respect to the concept of extroversion. The present results give support to the basic structural arrangement for extroversion presented most recently by Royce and McDermott (1976). In this arrangement, a higher-order factor (which they term "extroversion") is linked to factors of "social inhibition" and "general inhibition" at the lower-order, which in turn are linked to the basic primaries for extroversion (QI) and good upbringing (QVIII) or general inhibition respectively.

A similar hierarchical representation based on the present study is given in Figure 3 (p. 148). In this view, the higher-order factor is identified with Cattell's FIII, "Temperamental ardor", in T-data, and his recent Qα, "Inhibition" in Q-data. Conceptually, this factor may be Eysenck's construct of extroversion. At the lower-order, two factors are hypothesized which emphasize social inhibition and general inhibition respectively. They are extroversion - introversion, identified with Cattell's QI, exvia, and U.I. 32, exvia, along with Carrigan's concept of "Social extroversion" or "Sociability"; and secondly, good upbringing, identified with Cattell's QVIII, good upbringing, and U.I. 17, inhibition, along with Carrigan's concept of "Lack of self control" or "impulsivity".

The higher-order factor hypothesized here may resemble the fourth-order factor found in the Hendrickson-White hierarchical solution which combined three markers for U.I. 17, inhibition, four markers for U.I. 32, exvia, Impulsivity, and the Difference score from Eysenck's lemon-drop measure of E-I. As shown in Figure 3, it is identified with a higher-order factor previously found in objective tests (Hundleby, Pawlik and Cattell, 1965) and questionnaires (Cattell, 1975).

The higher-order objective test factor, FIII or "Temperamental ardor" has been reported earlier in this paper as one of two higher-order factors marked by extroversion, the other being FI, a socialization factor. As previously reported (p. 16f), Cattell and

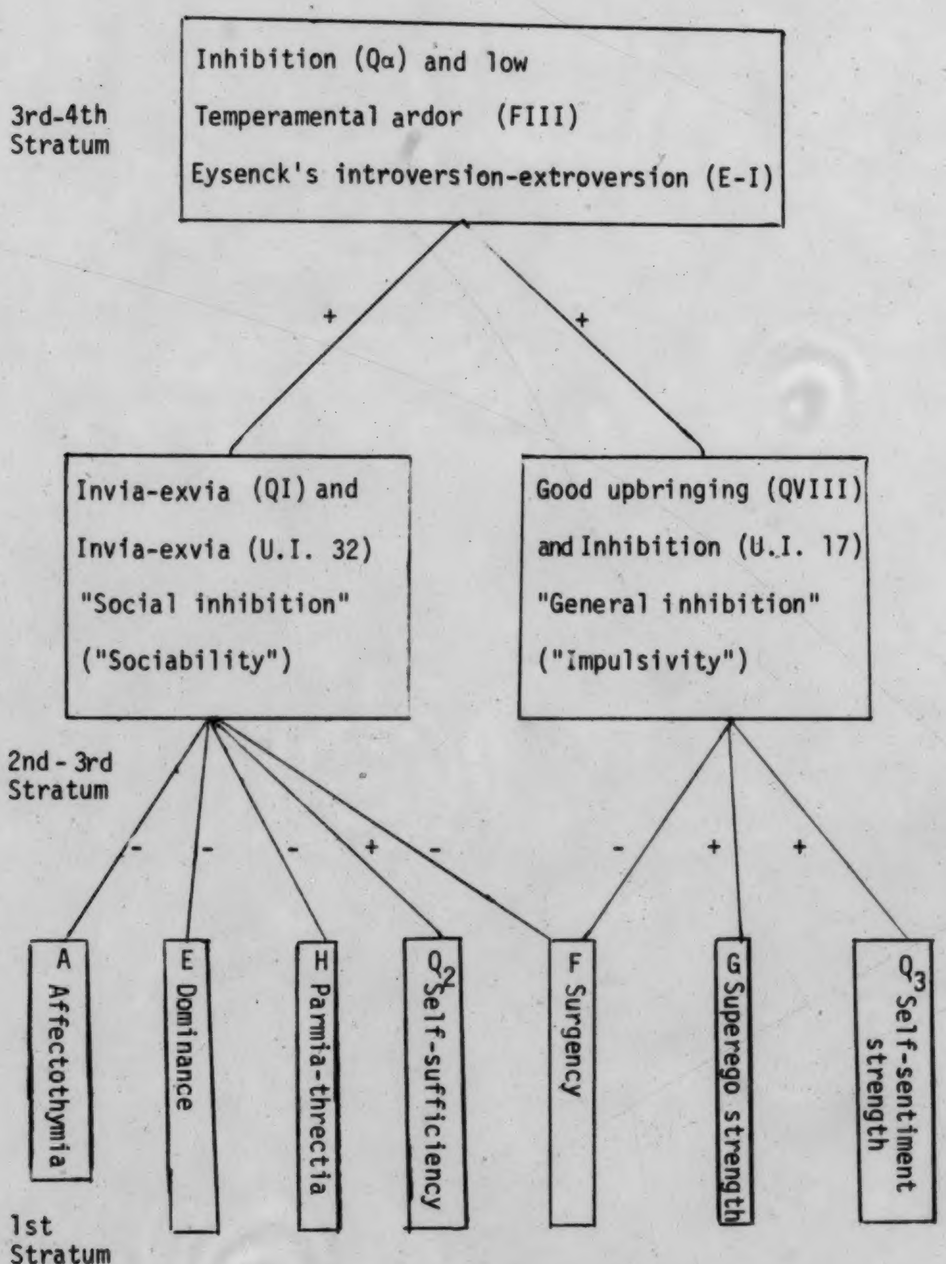
Inhibition (Qα) and low
Temperamental ardor (FIII)
Eysenck's introversion-extroversion (E-I)
3rd-4th Stratum
+
+
Invia-exvia (QI) and
Invia-exvia (U.I. 32)
"Social inhibition"
("Sociability")
Good upbringing (QVIII)
and Inhibition (U.I. 17)
"General inhibition"
("Impulsivity")
2nd - 3rd Stratum
-
-
-
+
-
-
+
+
A Affectothymia
E Dominance
H Parmia-threctia
Q2 Self-sufficiency
F Surgency
G Superego strength
Q3 Self-sentiment strength
1st Stratum

Figure 3. A taxonomic possibility from the present study. (Negative signs indicate negative loadings and correlations between factors.)

his associates interpreted FI as an "external control" factor, based on early learning experiences, and FIII, with its emphasis on dominance and insusceptibility to threat, as an "extrojection" factor based on constitutional features such as those Eysenck has suggested for extroversion itself. Third-order Factor Qα from Q-data has definite conceptual links not only to FIII above, but also to Eysenck's traditional concept of extroversion.

The theory of extroversion that could evolve from such a structure may acknowledge a spiral interaction among primary factors, molding extroversion as a result of social experiences, while in addition recognizing that higher-order constitutional and developmental influences also act as determinants. Influences in such a stratum model could act on extroversion from above or below, depending on the extent of their influence elsewhere in personality structure (Cattell, 1965).

The present study supports Carrigan's (1960) contention that Cattell's concept of extroversion resembles "social extroversion" from other analyses, but is in disagreement with the view that Eysenck's measure of extroversion is better aligned with the alternative concept of "Lack of self control" or "impulsivity." Rather, Eysenck's measure is fairly close to Cattell's, within the limits of reliability of the two questionnaires. While this may simply indicate that Eysenck's theory of extroversion will eventually merge with Cattell's views for exvia-invia, Eysenck's conceptualization of extroversion might more closely resemble a higher-order factor shared by both "Social extroversion" (QI) and "Lack of self control" (QVIII). Both factor analytic and traditional experimental studies are required to settle this issue.

In summary, the following conclusions may be offered:

1. The personality construct of extroversion is replicated, and closely resembles Eysenck's E-I and Cattell's QI from the EPI and 16 PF respectively. These latter constructs themselves are correlated about 0.70.
2. Other second-order factors from the 16 PF are replicated from the primaries, in particular QII (Anxiety), QIII (Cortertia), QIV (Independence), QVI (Idealism), and QVIII (Good upbringing). Independent verification similar to that found for QI is needed for these factors.
3. Objective test factors U.I. 16 (Assertiveness), U.I. 21 (Exuberance), U.I. 28 (Self-assuredness), and U.I. 32 (Exvia) are substantiated. The boundary conditions for objective tests as markers for specific factors must be clarified in further research.
4. Objective test factors U.I. 32 and U.I. 17 appear to match with QI and possibly QVIII respectively. The cross-media matches of U.I. 19 (Independence) with QIV and U.I. 22 (Cortertia) with QIII were beyond the scope of the present study. (U.I. 21 and U.I. 16 most closely resembled QIII and QIV respectively.)
5. Hierarchical analyses replicated third-order factors previously found in Q-data. In particular, correlated factors of "Social

inhibition" (marked by QI and U.I. 32) and "General inhibition" (marked by QVIII and measures for U.I. 17) were identified, and a higher-order "Inhibition" factor resembling Cattell's Qα in Q-data and FIII in T-data was found.

6. Sociability ("Social extroversion") and Impulsivity ("Lack of self control") were identified with Social and General inhibition respectively. Since Eysenck considers sociability and impulsivity as "dual" aspects of extroversion, his concept of extroversion may be identified with the higher-order Inhibition factor which loads Social and General inhibition. In accordance with this view, short scales for sociability and impulsivity from the EPI loaded only on these two factors respectively, and Eysenck's Difference score from the lemon drop test loaded on the higher-order Inhibition factor. Cattell's exvia-invia is identified with the concept of Social inhibition.
7. Adjustment is positively correlated with exvia, a lack of social inhibition and sociability, and negatively correlated with poor moral upbringing, a lack of general inhibition and impulsivity. The higher-order inhibition factor probably has less relation to adjustment. This is also the case for Eysenck's concept of extroversion.

In general, the present study corroborates the carefulness and precision that both Eysenck and Cattell have displayed at the empirical level. Their concepts are indeed in many respects very close empirically. The theoretical differences are revealed largely by implications from the factors and the factor structure replicated here. The results demonstrate the importance of careful empirical analyses -- factor analytic and experimental -- in the "distillation" of extroversion as a functionally unitary source trait.

Footnotes

1. Some writers continue to use the derivation from the French "extra" and "vertere"; i.e., "extraversion," rather than "extroversion."
2. McDougall (1929) hypothesized that, because of a chemical inhibition in the cerebral cortex, thought flourishes at the expense of emotional expression for the introvert. He also speculated that some intoxicating excitatory secretion accounted for extroversion. Even previous to McDougall, major theoretical contributions were made by Wundt, urging a dimensional rather than categorical analysis of personality; O. Gross, proposing physiological bases for personality; and G. Heymans, who demanded quantification and rigorous experimentation in the field of personality theory (see Eysenck, 1970a, b; 1973).
3. Scales for G (General activity), A (Ascendance), M (Masculinity), I (Inferiority feelings), and N (Nervousness) formed the later GAMIN Inventory (Guilford and Martin, 1943a), and scales for O (Objectivity), Ag (Agreeableness), and Co (Cooperativeness) formed the Personnel Inventory I (Guilford and Martin, 1943b).
4. It will become important to note that since there is substantial item overlap among the Guilford scales, 16 of the 24 R scale items selected for the E-I scale were also items for G (General Activity), A (Ascendance) and/or S (Social extroversion) (see Bendig, 1962a). In fact, studies to be discussed show a higher correlation of E-I with G, A and S than with R (e.g., Bendig, 1962a). The correlation of S with E-I and N is therefore at least partly a result of item overlap.
5. Eysenck's contrasting position is clearly expressed in a note reported by Jacob Cohen:

> If you regard, as I do, traits (i.e., primaries) simply as habits in the Hullian sense, then clearly they must be relatively unstable, shading into each other, and extremely difficult to circumscribe in any unambiguous fashion... (Eysenck, personal communication to Jacob Cohen, reported by Cohen, 1966, p. 859).

6. Cattell and Warburton (1967) define a marker as "a variable which is among the top three of four in loading on a given factor and which has little loading in any other factor" (p. 13).
7. Carrigan (1960) reconciles the two viewpoints by suggesting that a lack of sociability (introversion) and a lack of self control (extroversion) are maladaptive, so that the conceptualization of extroversion that balances both sociability and impulsivity will show no relationship to adjustment.
8. Guilford and Zimmerman (1949) found R inconsistently identified in their reanalysis of Lovell's data. Reanalyses of other Guilford factors were performed by Reyburn and Taylor (1943).
9. Bendig subsequently used a large number of factored items to produce the Pittsburg Scales of Social Extroversion - Introversion and Emotionality (Bendig, 1962b).
10. Exvia (QI) correlates more highly with Eysenck's sociability scale than impulsivity scale (+0.71 vs. +0.39: Crookes and Pearson, 1970).
11. As an example relevant to exvia, Cattell (1973a) cites the typical finding the physical scientists show overall introversion (A-, F-, Q_2+) but an extroverted "adventurousness" (H+); while certain highly creative individuals show more susceptibility to threat (H-), but higher overall extroversion (A+, F+, Q_2-) (Drevdahl and Cattell, 1958; Cattell and Drevdahl, 1955).
12. M.I. numbers represent specific test variables as catalogued by

Master Index numbers in the compendium of Cattell and Warburton (1967). U.I. numbers correspond to those proposed by Cattell (1957b) for a universal index system for psychological factors.

13. By "objective", Cattell means "the subject does not really (he may believe he does) know for certain in what way his behavior is being measured or what kinds of personality inference will be drawn from his test reactions" (Cattell and Warburton, 1967, p. 16). More generally, Cattell (1958) distinguishes the objective vs. self-appraising stimulus situation, the selective vs. inventive (open-ended) response opportunity, and the "conspective" vs. "rative" scoring basis, the former in each case usually distinguishing his objective personality tests.

14. See Cattell and Warburton, 1967, p. 25, fn. 4. In addition, of course, no linear dependencies exist among variables subjected to factor analysis together.

15. Reported "loadings" are, in fact, reference structure loadings. Cattell and Warburton (1967, p. 279) defer to Hundleby, Pawlik and Cattell (1965) on this point, where it is made explicit (p. 131f, expecially fn. 1).

16. Personal communications with Dr. L. R. Schmidt, and R. B. Cattell, Laboratory of Personality Assessment and Group Analysis, Summer 1971.

17. The type of lemon juice used in this study ('Realemon') has been shown (Wardell, 1974) to be maximally related to extroversion differences at a strength somewhat greater than that reported by Eysenck and Eysenck for fresh lemon juice (mean Difference score = 0.4450 gm.). The mean Difference score in this study was 0.6809 gm.,

indicating that this lemon juice was quite effective (mean Trial 1 score was 0.1913 gm.). Since it was possible, as Eysenck and Eysenck suggest, that one salivates faster, rather than more, to fresh lemon juice, the lemon drops were placed on the tongue for 30 seconds, a time interval that they show is sufficient to minimize this possibility.

18. Tests were made to assess the error of measurement caused by all the lemon drops being absorbed by the cotton roll in the subject's mouth. The mean error was 0.140 gm. or 16% of the average Trial 2 measure. All measurements were made on a Mettler electric balance.

19. Previous research (e.g., Farley, 1970) has been negligent in reporting scoring procedures, and this information was not communicated when a personal query was made.

20. Cattell states, "...several of the scales in the test underwent considerable revision and intensification between 1961 and 1968" to improve the validity and consistency of the 1962 version which is still most widely used (Cattell, Eber, Tatsuoka, 1970, p. 29).

21. In defense of the somewhat arbitrary use of ±0.25 as the cut-off for significant loadings, Cattell and Klein (1975) state, "...a 'useful' loading for factor estimation is conservatively taken to be 0.30 or above (actually the correlation - which is the basis of significance estimation - as given in the factor structure matrix should be above 0.25)." Citing recent unpublished findings (Cattell, Finkbeiner and Vaughan, 1974) which show that typically any loading above 0.20 is significant at the $p < .05$ level in their rotations ($2\sigma = 0.15$), Cattell and Klein conclude that ±0.25 is an appropriate criterion for a marker variable.

22. $\underline{Z}$ was originally calculated through a batch program (DEST06) which proved too inexact (average error of 0.00205 between $\frac{X'X}{N}$ and $\underline{L}$, while an average error of only 0.0000123 between $\underline{G}'\underline{G}$ and $\underline{L}$). An APL z-score program was subsequently applied so that the average error between $\frac{X'X}{N}$ and $\underline{L}$ was reduced (to 0.000689).

23. The same matrix with the lower-order variables in "raw-score" form is available from the author. Also, the separate sex intercorrelation matrices for both T-score and "raw-score" variables are available from the author.

24. Only one additional variable -- from Table VI, T121 (CMS), M.I. 15, more use of circles (i.e., quick, assertive performance) -- is related to both E-I and QI for males only. There is a slight trend for experience and confidence in skills -- variables (14) 12* and (32) 28 respectively -- to be more correlated with QI than E-I.

25. If one concedes that Cattell's measures M.I. 455a, b from T233 (salivation measures without stimulation) are comparable to the Trial 1 measure above, then one could suggest that the Trial 1 measure is a better U.I. 17 marker than M.I. 455a, b have been. (Theoretically, Cattell points out that M.I. 455a, b should be strong markers for U.I. 17). This might suggest the presence of U.I. 17 in the Extroversion pattern. However, there is no substantiation for M.I. 455a, b as markers for U.I. 17.

26. Cattell and Klein (1975) recently had difficulty replicating the U.I. 32 pattern with a junior high school sample. Their test battery does not overlap with the present battery to a degree that would allow comparison of their U.I. 32 pattern to that found here.

27. F does appear as a significant marker in the P'P proportional to L solutions in this study.

28. The loading for M is much higher in the P'P proportional to L solution.

29. Refraction factors, according to Cattell (1961), are factors which appear when variables from different media are factored together, so that certain factors may be identifiable, but show up separately in the first-order solution because they represent "refractions" of a single functional unity "through" different media.

30. In a further analysis of the present data, a principal components analysis with Harris-Kaiser independent cluster transformation was performed on the 30 objective test variables alone. The resultant factor scores were correlated with the Image factor scores on all 49 variables. Factors 2 (U.I. 21), 7 (U.I. 32), 8 (U.I. 28) and 13 (U.I. 16), along with test specific factors 4, 5 and 10 all correlated at least ±.85 with corresponding factors from the Image analysis. The U.I. 32 factor correlated 0.33 and 0.40 with Eysenck's E-I and Cattell's QI respectively, and 0.41 with Factor I (extroversion) from the present study.

31. From the intercorrelations of variables, it is clear that the lemon-drop test was different for males and females. The variables are highly correlated for females, and both have the same low relation to extroversion, while for males, they are not highly related, and unrelated to extroversion. In fact, salivation (even if highly unreliable) may be partly determined by Cortertia in this test situation for females: "cortically alert" females

salivate somewhat less than "pathemic" females. Salivation on Factor VII (exvia) is in the opposite direction to Eysenck's prediction for extroverts.

32. Eysenck's neuroticism scale (N) from the EPI was also scored, although it was not included in the present study. Mean and standard deviation were 11.7 and 4.6 respectively. N correlated with Cattell's QII, anxiety, 0.66, and with Factor III, anxiety, 0.67. As expected, neuroticism and "Social extroversion" (i.e., Factor I, extroversion) were negatively related (r = -.26), but it was interesting to note that neuroticism and "Lack of self control" (i.e., Factor IX, good upbringing) were positively correlated (r = .23), in accordance with Carrigan's expectations. The correlation of neuroticism with Cattell's QI, exvia, was -0.16 and with Eysenck's E-I was -0.12.

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APPENDIX A

PROCEDURE

"This experiment is a series of very short tests which we are going to do in unison. Therefore, it is very important that everyone obeys the instructions and follows along with the others in the group. There will be one group of tests, for about an hour, followed by a break and then another group of tests. If everyone keeps up, we should be finished in two hours easily. One rule: please do not smoke during the test session.

Alright, lets get started. Please take out the first test from your test envelope, and sign your name at the top."

T6 "This is a Reading Comprehension Test"

"I want you to read at your ordinary, natural rate, as if you were reading for pleasure. It is not a test to see how fast you can read. The passages are too long for anyone to reach the end. So, when I call time, circle the line number which you have reached at the moment I say 'Stop'. DO NOT MARK FURTHER THAN YOU READ, FOR YOU MAY BE ASKED QUESTIONS ABOUT WHAT YOU READ."

Time: 1 minute for each passage x 4 passages = 4 minutes. Timed.

T13 "Knowledge of People's Characteristics."

"Please read the instructions but do not start the test." Instructions are given. Give time to read them before timing the test. "Any questions?"

Time: 4 minutes (2 minutes for each page). Timed.

T20 "Modernistic Drawings."

"Please be sure that you have 8 drawings in your test." S is presented with the first picture. Instructions are given orally, as follows: "This is an imagination test. On these pages you will see some modernistic drawings. It is not very clear what is in these drawings but different people manage to see a number of different things. You will be allowed 1/2 minute on each drawing, and in that time I want you to write down as many things as you can that you can really see in it. Don't waste time writing out your answer in full, but just write down one short word on each line for one object or happening that you can see." "I will say when to turn each page and when to stop."

Time: 4 minutes (1/2 minute for each page). Timed.

T23 "Ideas about Past and Future."

"Do not spend time writing your ideas out in full, but just use a word or two in a phrase. For example, you might say, when giving some pleasant ideas from the past, 'wonderful picnics', friendship with John', or in your worries about the future, 'illness', 'passing examinations', 'wisdom tooth' (meaning 'I've got to get my decayed wisdom tooth out'). You have 4 minutes on the whole test. You may start now."

Time: Allow 4 minutes for the entire test. Timed.

T25 "Book Preferences."

"Please read the instructions and go ahead with the test. It is not strictly timed." "Please put the test in the back of the envelope when you are finished, but do not take the next test out."

Time: Allow about 3 - 5 minutes. This test is not timed strictly.

T44a and b "Matching Letters and Numbers."

"Please read the instructions to yourself. Any questions?" "I will say when to turn each page and when to stop. Turn the page and start." After 4 pages say: "Please read the instructions to yourself. Any questions?" "Turn the page and start." Instructions are given.

Time:	Section A	1.	Comparison of letters	30 sec.
		2.		45 sec.
		3.		45 sec.
		4.		30 sec.
	Section B	1.	Comparison of numbers	30 sec.
		2.		45 sec.
		3.		45 sec.
		4.		30 sec.

T45 "Judgment of Lines."

"Please read the instructions but do not turn the page." "Any questions?" "Turn the page and start." After 30 sec., say "Turn the page." Instructions are given.

Time: 30 sec. for each page = 2 minutes total. Time test.

T62b "Which is More."

"Please read the instructions but do not start the test." "Any questions?" "Go ahead and start on the first page."

T64 "Best Friends and Acquaintances."

Read the first page of the test copy out loud. First, read the "friends" part. Then ask them to list their friends on the next page. After 2 minutes, say "stop". Next read the "acquaintances" part. Then ask them to list their acquaintances on the last page. After 2 minutes, say "stop".

Time: 2 minutes each part = 4 minutes total. Timed test.

T121 "Obstacles."

"Please check that you have 6 pages not including the first page." "I am going to read the instructions out loud." Read the instructions out loud. Then say: "Will you please now read these instructions to yourself, so that you know exactly what to do (pause 30 sec.). Any questions? All right, look at the marks on the example, on this page only, to show you how it's done, (pause 10 sec.). Any questions? Before we turn over there is one last point to be made. On the first run along the top path of each of the six pages, I shall shout 'over' as you get near the end of each page, and whether you have got to the end or not, you must then turn over at once and start on the same path on the next page. I want to see all pages turned at exactly the same moment. Do not forget, you can use only six circles in each obstacle course. There are 4 obstacle courses, each of which goes across 6 pages. Ready? Turn over and begin at path number 1." After 12 sec. exactly call "over". Repeat this until page 6 where at 12 sec. you call "stop". "Pencils down. Now turn back to the cover page. This time we shall do the second line down all six pages in just the same way. Ready? Turn over and start at path number 2."

Repeat as for the first one. Repeat tor paths 3 and 4, but before beginning say, "You will have to go a little faster than the first path this run". Allow only 6 sec. per line, for fourth line also.

Time: Paths 1 and 2, 12 sec. per page x 6 pages = 72 sec. per path = 144 sec. Paths 3 and 4, 6 sec. per page x 6 pages = 36 sec. per path = 72 sec. Total time = 216 sec. = 3 min. 36 sec.

T167 "Task Checking."

Tell the S: "In Part I write down things you do well." Then he turns over the page and in Part II finds instructions to turn back and rate how much he likes doing the things he has already written down. (Give the S two minutes for Part I.)

Time: 4 min. approximately. Not a timed test.

T187 "Jokes and Tricks."

"Please read the instructions and go ahead." Instructions are given.

Time: 2 min. approximately. Not a timed test.

T361 "Short Attitude Survey."

Take care that no one turns the title page until the signal is given. Say, "Read through the instructions on the first page. When you are finished, look up." "Any questions? Turn the page and begin." After exactly 3 min. say, "Stop! Put the test in the back of the envelope."

Time: 3 min. Timed Test.

EPI "The Eysenck Personality Inventory."

Please fill in your name, your age and your sex. When you have done that, please read the instructions and proceed." "After this test there will be a short break." Ask them to read the instructions and proceed.

Time: 10 min. approximately. Not a timed test.

BREAK

Allow a rest for about 5 min. No one allowed out except for washroom.

"Please take the 2 answer sheets out of your test envelope. Write your name on the top of both pages." Introduce them to the answer sheets. "The answer sheets will be used for the remaining tests." "DO NOT write on the question sheets and DO NOT put the question sheets into your test envelope. Leave them on the table."

T8 "Goodness of Work."

"Please read the instructions." For T8, allow them to read the instructions. Pause for questions, and say "You may begin." After 3 min., say "Stop". "Do not put the test in your envelope."

Time: 3 min. Time test.

T19 "Estimation of Time Required."

"Please read the instructions." Allow them to read the instructions. Pause for questions, and say "After you have done Part I, go on to Part II, but notice that Part II asks you how long it would take OTHER PEOPLE to do things, not you. Just think of the average persons you know." "Go ahead." Afterwards: "Do not put the test in your envelope."

Time: Allow about 5 - 10 min. Not a timed test.

T22 "Survey of Experience and Skills."

"Please read the instructions and proceed with the test." Allow them to read the instructions. Pause for questions, and then let them proceed.

Time: Allow about 4 min. Not a timed test.

T49d "Counting Letters and Numbers."

"Please read the instructions but do not begin the test." Allow them to read the instructions. Pause for questions, then say "Start" at the beginning of each part. Say "Stop" after 30 sec. each time. Time: 4 parts x 30 sec. each = 2 min. Timed test.

T97 "Crime and Punishment."

"Please read the instructions." "Please ignore numbers 15 through 28 on your answer sheet." Allow them to read the instructions. Pause for questions, then say "Start" and, after 2 min., say "Stop"." Time: 2 min. Timed test.

16PF

"Put that answer sheet into the back of your envelope. Then take out the answer sheet for the 16PF. Please put your name, sex, and age on the answer sheet. Then, read the instructions and proceed. When you are finished, put the answer sheet in the back of your envelope and leave the test on your table. Then, bring your envelope with you to Room 305 across the hall. A very short individually administered test will be given there. That will conclude this experiment. Please fill out your experiment cards while you are waiting, and bring them with you too."

Lemon Drop Test

"This is an experiment to compare how much different people salivate to the same stimulus. First, I will ask you to put a cotton roll under your tongue to get a measure of your normal salivary rate. Then I will ask you to put another cotton roll under your tongue and I will put a couple of drops of a harmless liquid on your tongue with an eyedropper. Do not try to swallow or move your mouth at all while you have a cotton roll in your mouth."

After this test, subjects are thanked profusely and given a "Feedback" paper for their information concerning the nature of the experiment.

APPENDIX B

a. HARRIS IMAGE ANALYSIS (Kaiser, 1963)

Harris Image Analysis involves the decomposition of each score, z_{ij}, into a part predictable from the other variables (the "image"), p_{ij}, and the part remaining (the "anti-image"), e_{ij}. This is represented

$$Z = P + E$$

where $\underline{Z}$, $\underline{P}$, and $\underline{E}$ are $\underline{N}$ persons by $\underline{n}$ variables, and

$$P = ZB$$

where $\underline{B}$ ($\underline{n} \times \underline{n}$) is the matrix of beta-weights derived from

$$B = I - R^{-1}S^{2},$$

$\underline{R}$ ($\underline{n} \times \underline{n}$) being the correlation matrix of the variables, and $\underline{S}^2$ ($\underline{n} \times \underline{n}$) being the diagonal matrix of uniqueness estimates. Since the squared multiple correlation (smc) of variable j is the lower bound on its communality,

$$s^2_j = 1 - \mathrm{smc}_j$$

and since

$$\mathrm{smc}_j = 1 - \frac{1}{r^{jj}}$$

where r^{jj} is the j^{th} diagonal element of $\underline{R}^{-1}$, then

$$s^2_j = \frac{1}{r^{jj}}$$

Therefore, the Image Model may be represented analogously to the Component and Common Factor Models as

$$P = XF'$$

where $\underline{X}$ ($\underline{N} \times \underline{r}$) is the matrix of factor scores and $\underline{F}$ ($\underline{n} \times \underline{r}$)

is the matrix of beta-weights to be applied to the factor scores to predict the images. This is comparable to

$$Z = XF'$$

and

$$C = XF'$$

for the Component and Common Factor Models respectively.

The factor pattern matrix, $\underline{F}$, may be derived in two ways. A covariance matrix, $\underline{G}$, of images

$$G = \frac{P'P}{N}$$

is the source of Image factors. $\underline{G}$ consists of smc's in the diagonal, and covariances rather than correlations in the off-diagonals. As $\underline{Q}$, the covariance matrix of anti-images

$$Q = \frac{E'E}{N}$$

approaches diagonal, it has been shown that $\underline{G}$ approaches the common factor model $\underline{R} - \underline{U}^2$. Therefore Image Analysis is an approximation to the Common Factor Model with the Component Model feature that it is exact. Factor scores, then, as in the component model, are exact linear combinations of scores on the data variables.

Harris Image Analysis is a result of Harris' (1962) epic paper delineating the relations among the above models. While it is possible to factor $\underline{G}$ by a roots and vectors decomposition of $\underline{G}$ directly,

$$G = V\Lambda V'$$

it is more universal to form the Harris matrix, $\underline{R^*}$, and perform the roots and vectors decomposition thereupon:

$$R^* = S^{-1}RS^{-1}$$

$$R^* = W\Gamma W'$$

Then it may be shown that the eigenvectors of $\underline{G}$ are equal to $\underline{W}$ and the eigenvalues of $\underline{G}$ are a simple rescaling of the eigenvalues of $\underline{R}^*$, namely, $(\Gamma - I)^2\Gamma^{-1}$. Therefore, the "unrotated" factor pattern matrix, $\underline{F}$, is

$$F = SW\,((\Gamma - I)^2\Gamma^{-1})^{1/2}$$

Image Analysis is more recently becoming adopted as a potent practical model for substantive factor analysis (e.g., see Harris, 1971). Some more theoretical aspects are summarized by Wardell (1975).

b. CALCULATION OF REFERENCE VECTOR MATRICES

The reference structure matrix, $\underline{V}$, and the matrix of correlations between reference vectors, $\underline{\Psi}$, were derived as follows from the primary pattern matrix, $\underline{P}$, the primary structure matrix, $\underline{S}$, and the matrix of correlations between primary axes, $\underline{L}$. $\underline{A}$ is the original unrotated matrix. Given that $\underline{G}$ is the transformation matrix from $\underline{A}$ to $\underline{S}$:

$$S = AG$$

and $\underline{\Lambda}$ is the transformation matrix from $\underline{A}$ to $\underline{V}$:

$$V = A\Lambda$$

then it may be shown that

$$L = G'G$$

and

$$\Psi = \Lambda'\Lambda.$$

Given that $\underline{D}$ is the matrix of correlations between the primary axes and the reference vectors

$$D = G'\Lambda,$$

then D̲ is the diagonal transformation matrix from the primary pattern to the reference structure

$$V = PD.$$

D̲ can be derived from the following equation:

$$D = [\mathrm{diag}\ (L^{-1})]^{-1/2}.$$

Therefore, given

$$S = AG$$

then $G = (A'A)^{-1}\ A'S$

and then $L = G'G$

and $D = [\mathrm{diag}\ (L^{-1})]^{-1/2}.$

Given $D = G'\Lambda$

then $\Psi = \Lambda'\Lambda.$

V̲ is given by $V = PD.$

These calculations and the derivation of Image factor scores were made using the interface of the Michigan Terminal System (MTS) with on-line processing by A Programming Language (APL) on the IBM 360/67 system at the University of Alberta.

APPENDIX C

RESULTS: PART I. Five Higher-order Factor Variables.

	Means		
	Combined sexes	Males	Females
E (Extroversion)	12.60	12.53	12.68
QI (Exvia)	4.8787	5.0247	4.6945
QII (Anxiety)	5.9425	5.8472	6.0627
QIII (Cortertia)	5.4944	5.4198	5.5884
QIV (Independence)	5.8912	6.0541	5.6858

	Standard Deviations		
	Combined sexes	Males	Females
E (Extroversion)	3.86	3.45	4.31
QI (Exvia)	1.7518	1.6297	1.8785
QII (Anxiety)	1.7792	1.7924	1.7551
QIII (Cortertia)	1.7034	1.6968	1.7071
QIV (Independence)	1.7428	1.7608	1.6978

RESULTS: PART I. 53 Lower-order Variables (see Table VI).

	Means		
	Combined sexes	Males	Females
(1)	22.77	22.04	23.68
(2)	34.50	31.43	38.37
(3)	46.62	46.52	46.76
(4)	4.06	3.78	4.40
(5)	7.85	7.56	8.22
(6)	6.36	6.40	6.30
(7)	9.98	9.72	10.32
(8)	18.87	18.99	18.72
(9)	22.86	20.97	25.25
(10)	15.84	15.24	16.59
(11)	14.10	13.41	14.97
(12)	16.09	15.53	16.79
(13)	18.75	18.56	19.00
(14)	44.53	43.35	46.01
(15)	10.72	10.22	11.34
(16)	17.28	15.47	19.55
(17)	14.83	13.65	16.33
(18)	29.35	30.34	28.09
(19)	30.93	31.04	30.78
(20)	13.60	13.44	13.79
(21)	8.26	8.41	8.07
(22)	31.71	31.85	31.52

RESULTS: PART I. (Cont'd)

		Means		
		Combined sexes	Males	Females
(23)		8.24	7.77	8.84
(24)		10.15	9.88	10.50
(25)		61.51	61.48	61.55
(26)		41.08	38.84	43.90
(27)		11.25	11.18	11.34
(28)		8.72	8.47	9.04
(29)		28.57	27.38	30.08
(30)		98.51	97.42	99.88
(31)		20.51	20.80	20.14
(32)		8.49	7.97	9.13
(33)		0.19133	0.20470	0.17448
(34)		0.68092	0.69527	0.66283
(35)		0.52	1.00	0.00
(36)	A	9.55	9.09	10.12
(37)	B	8.78	8.68	8.91
(38)	C	14.28	14.36	14.17
(39)	E	13.12	14.18	11.79
(40)	F	15.93	15.33	16.70
(41)	G	10.94	11.12	10.72
(42)	H	12.29	12.62	11.87
(43)	I	11.42	9.79	13.48
(44)	L	9.06	9.76	8.17
(45)	M	13.17	13.22	13.12

RESULTS: PART I (Cont'd)

		Means		
		Combined sexes	Males	Females
(46)	N	8.89	8.52	9.37
(47)	O	11.33	10.66	12.18
(48)	Q_1	9.81	11.09	8.21
(49)	Q_2	11.33	11.41	11.22
(50)	Q_3	10.89	11.16	10.55
(51)	Q_4	13.99	13.28	14.88
(52)	Impulsivity	1.77	1.67	1.89
(53)	Sociability	4.70	4.67	4.73

RESULTS: PART I (Cont'd)

	Standard Deviations		
	Combined sexes	Males	Females
(1)	6.58	7.16	5.65
(2)	11.39	11.53	9.95
(3)	7.72	7.45	8.04
(4)	2.58	2.47	2.66
(5)	3.10	3.22	2.90
(6)	3.00	3.06	2.92
(7)	2.51	2.66	2.27
(8)	3.74	4.07	3.26
(9)	8.66	9.07	7.45
(10)	3.22	3.33	2.92
(11)	2.98	2.89	2.86
(12)	3.03	3.12	2.75
(13)	2.27	2.36	2.14
(14)	5.59	5.30	5.58
(15)	2.42	2.39	2.31
(16)	6.10	6.14	5.23
(17)	5.10	4.77	5.11
(18)	4.32	4.20	4.14
(19)	4.11	4.03	4.21
(20)	3.87	3.82	3.93
(21)	3.52	3.41	3.66
(22)	5.34	5.69	4.86

RESULTS: PART I (Cont'd)

	Standard Deviations		
	Combined sexes	Males	Females
(23)	3.34	3.41	3.15
(24)	3.40	3.30	3.50
(25)	10.25	9.65	10.96
(26)	8.84	9.20	7.47
(27)	3.98	3.93	4.05
(28)	2.46	2.71	2.04
(29)	6.52	6.73	5.91
(30)	33.91	33.46	34.41
(31)	3.98	4.23	3.61
(32)	2.31	2.17	2.32
(33)	0.17380	0.19833	0.13487
(34)	0.62186	0.68210	0.53588
(35)	0.50	0.00	0.00
(36)	3.21	2.95	3.41
(37)	1.74	1.77	1.69
(38)	3.90	3.73	4.09
(39)	4.12	3.75	4.19
(40)	4.70	4.51	4.82
(41)	3.46	3.29	3.65
(42)	5.68	5.30	6.09
(43)	3.89	3.55	3.28
(44)	3.20	3.17	3.02
(45)	3.59	3.82	3.27

RESULTS: PART I (Cont'd)

	Standard Deviations		
	Combined sexes	Males	Females
(46)	2.75	2.79	2.63
(47)	3.67	3.72	3.43
(48)	3.54	3.48	2.89
(49)	3.35	3.39	3.29
(50)	3.12	2.96	3.29
(51)	4.51	4.84	3.88
(52)	1.25	1.08	1.43
(53)	2.01	2.04	1.97

RESULTS: PART II. Intercorrelation Matrix (Combined sexes, T-score data).

Note: The first 53 variables are the separate sex mean-deviated lower-order variables as given in Table VI. The next five variables are the five higher-order factor variables as given in Table VI. (Note that variables 3, 11, 14, and 26 were dropped from the factor analyses: see ANALYSIS section, stage four.) Similar separate sex T-score matrices and the corresponding combined sexes and separate sexes "raw-score" matrices are available from the author.

CORRELATIONS

	1	2	3	4	5	6	7	8	9	10
1	1.000000	0.296409	0.242629	0.035919	-0.066813	0.050726	-0.102763	0.091552	0.091874	0.450432
2	0.296409	1.000000	0.207611	0.428115	-0.001696	0.019797	-0.146428	0.101623	0.014223	0.272287
3	0.242629	0.207611	1.000000	0.061429	-0.116739	0.126470	-0.095503	0.106518	0.064460	0.257546
4	0.035919	0.428115	0.061429	1.000000	0.014312	0.011128	-0.043199	0.065394	-0.016057	0.158712
5	-0.066913	-0.001676	-0.116739	0.014312	1.000000	-0.039137	-0.005372	-0.007198	-0.197969	-0.082005
6	0.050726	0.019797	0.126470	0.011128	-0.039147	1.000000	0.004748	0.193561	-0.089486	0.083254
7	-0.102763	-0.146428	-0.095503	-0.043199	-0.005372	0.004748	1.000000	-0.051860	0.024160	-0.148203
8	0.091552	0.101623	0.106518	0.065394	-0.007198	0.193561	-0.051860	1.000000	0.062927	0.054176
9	0.091874	0.014223	0.064460	-0.016057	-0.197969	-0.085486	0.024160	0.062927	1.000000	0.104941
10	0.450432	0.272287	0.297546	0.158712	-0.082005	0.083254	-0.148203	0.054176	0.104941	1.000000
11	0.263644	0.183618	0.425845	0.087833	0.051790	0.012070	-0.077332	0.047108	0.012526	0.404472
12	0.284055	0.075430	0.468522	0.055050	0.065784	0.065787	-0.027861	0.022640	0.011616	0.383705
13	0.264155	0.186710	0.228497	0.048537	-0.077876	0.048358	0.001058	0.032470	0.083615	0.455029
14	0.055675	0.179776	0.082066	0.088327	0.123861	0.000941	-0.002897	0.032223	0.013424	0.130837
15	0.154613	0.162264	0.392143	0.196751	0.039514	0.026145	-0.066715	0.026793	0.096028	0.322403
16	0.208983	0.178554	0.140007	0.074649	-0.140553	-0.019278	-0.107233	0.012997	0.569233	0.336144
17	0.282128	0.281317	0.148017	0.047680	0.009420	0.226234	0.117037	0.048876	0.009623	0.275472
18	0.213900	0.137458	0.201531	0.045284	0.011952	0.033339	0.004226	0.274211	0.035771	0.174771
19	0.059554	-0.049516	0.077343	-0.034143	-0.003169	-0.029828	-0.025744	0.162482	0.092430	0.089806
20	0.257326	0.270861	0.052623	0.046657	0.067937	0.000868	-0.248705	0.035845	-0.054273	0.108407
21	0.022596	-0.100999	0.024546	-0.108147	-0.003151	0.008421	0.055589	0.022621	0.030978	0.137563
22	0.034167	0.193065	0.152601	0.095288	0.012729	-0.004616	0.012911	0.069721	-0.018259	-0.065406
23	0.197795	0.339937	0.122879	0.086115	0.013820	0.125942	0.005357	0.117168	-0.100395	0.208953
24	-0.073777	-0.144120	-0.058549	-0.093377	-0.034531	0.076194	0.011174	0.006602	0.056216	-0.075405
25	0.365160	0.237724	0.022893	0.085912	-0.075997	0.138226	-0.122045	0.082900	0.000144	0.387192
26	0.204664	0.119349	0.443352	0.171251	0.094756	0.105945	-0.007867	-0.008079	0.083959	0.351981
27	0.201886	0.240100	0.373683	0.026704	0.033193	0.055680	-0.144242	0.122278	0.077849	0.249234
28	0.355217	0.178869	0.304441	0.074920	-0.074664	0.013751	-0.064831	0.062730	0.066436	0.541344
29	0.012808	0.029330	0.224544	-0.043204	-0.071873	0.142660	0.011267	-0.070328	-0.064663	-0.008183
30	0.113862	0.074757	0.190747	0.045286	-0.053402	-0.038940	-0.140799	0.087439	0.110336	0.096960
31	0.092146	0.104740	-0.003522	0.017437	-0.011293	-0.105158	-0.124341	0.055866	0.004458	0.097154
32	-0.015758	0.180031	0.073040	0.116774	0.131399	0.025960	0.002185	-0.060175	0.000001	0.072828
33	0.119841	-0.024404	-0.037087	-0.051693	0.027786	-0.036756	0.038751	0.052382	0.101069	-0.028095
34	0.043390	0.065984	0.123221	-0.026149	-0.133109	0.049560	-0.006543	0.117526	0.011056	-0.021176
35	-0.020133	0.009443	-0.007466	-0.012977	0.074419	-0.001625	-0.006751	-0.003392	-0.035724	0.010654
36	-0.031092	-0.028077	-0.069525	-0.037351	0.165452	0.056049	0.028720	0.049307	0.053116	-0.007827
37	-0.006115	0.086950	0.057291	-0.031390	-0.022247	-0.051779	-0.043061	0.053678	0.098792	-0.005183
38	0.137557	0.078694	-0.130070	-0.063693	0.111453	-0.066658	-0.071572	0.077247	-0.002709	0.068386
39	0.222692	0.157745	0.026299	0.027401	-0.143034	-0.034877	-0.010319	0.174464	0.091274	0.152518
40	0.110820	0.101534	-0.016769	0.022214	-0.069587	0.269398	0.031707	0.103755	-0.023918	0.094560
41	-0.124570	-0.178664	0.042316	-0.025105	0.114937	-0.062320	0.114517	0.010769	0.001711	-0.056824
42	0.066743	0.175231	-0.160378	0.096651	0.121031	0.075729	-0.087910	0.133774	0.058472	0.064829
43	-0.059265	0.010217	-0.188725	0.020604	0.123623	0.007878	-0.094057	0.109391	0.087747	-0.076253
44	0.022634	0.024672	0.045925	0.144628	-0.070514	0.152904	0.082821	0.147315	0.053377	0.023057
45	0.172052	0.189013	-0.085248	-0.018877	-0.023195	-0.077228	-0.153627	0.241547	0.100249	-0.055297
46	-0.072099	-0.067058	-0.051604	-0.021950	0.040974	-0.086470	-0.140030	-0.057601	0.079959	-0.141035
47	-0.054301	-0.101189	0.025418	-0.025365	-0.005031	0.002665	0.103193	-0.113621	-0.025617	-0.035154
48	0.074869	0.100273	0.071931	-0.002946	-0.168902	-0.100547	-0.005381	0.111042	0.035115	0.035205
49	0.116604	-0.008990	-0.018265	-0.148867	-0.092663	-0.056500	-0.021542	0.054837	0.055016	0.020663
50	-0.023359	-0.092099	0.032688	-0.007794	0.118531	-0.035931	0.018196	0.061922	0.030686	-0.091368
51	-0.033416	-0.013550	0.090299	-0.072845	-0.153016	0.062061	0.106368	-0.106829	0.112243	0.047656
52	-0.041719	0.004510	-0.027153	0.066479	0.041880	0.086241	0.257328	-0.061049	-0.079684	-0.067512
53	0.051579	0.114260	-0.083560	0.140246	0.069831	0.127764	0.030181	0.006286	0.054750	0.069901
54	0.099549	0.066384	-0.032509	0.112044	0.051092	0.209536	0.067825	0.043834	0.033388	0.116750
55	0.095476	0.104806	0.043407	0.035259	0.055552	0.226403	0.040807	0.101444	0.011765	0.131714
56	-0.099945	-0.110626	0.107515	0.002203	-0.116117	0.063612	0.127748	-0.133532	0.036898	-0.005581
57	0.209006	0.039522	0.062016	-0.039714	-0.123959	0.113425	0.052954	0.043573	-0.016117	0.175733
58	0.253512	0.219600	-0.006492	0.023974	-0.127873	-0.037051	-0.092722	0.287806	0.120901	0.113586

	11	12	13	14	15	16	17	18	19	20
1	0.263644	0.284055	0.264195	0.056675	0.164613	0.208393	0.282128	0.213900	0.069554	0.257326
2	0.193614	0.075410	0.195710	0.179776	0.152954	0.176954	0.291917	0.137458	-0.349516	0.273861
3	0.405645	0.468522	0.224497	0.042066	0.302143	0.140007	0.149017	0.201531	0.077343	0.052873
4	0.087633	0.055030	0.041517	0.049327	0.136751	0.074649	0.047600	0.045284	-0.034143	0.046857
5	0.051790	0.035744	-0.077876	0.123861	0.049514	-0.140553	0.308420	0.011562	-0.003169	0.067837
6	-0.012070	0.065797	0.048358	0.000941	0.026145	-0.019278	0.226234	0.031339	-0.029824	0.060868
7	-0.077132	-0.027861	0.001058	-0.002897	-0.066715	-0.107244	0.117037	0.004226	-0.025744	-0.248705
8	0.047164	0.322640	0.032470	0.032223	0.028753	0.012997	0.049876	0.274211	0.102482	0.035845
9	0.012526	0.311616	0.083615	0.013424	0.096028	0.569233	0.303623	0.035771	0.092410	-0.054273
10	0.408462	0.383705	0.455029	0.130837	0.312403	0.336144	0.275472	0.174771	0.049806	0.108407
11	1.000000	0.792757	0.154066	0.011405	0.418014	0.168469	0.083866	0.150456	0.018503	0.042370
12	0.792757	1.000000	0.154509	0.004019	0.476607	0.153627	0.095136	0.250203	0.085161	0.040708
13	0.154066	0.154509	1.000000	0.072197	0.194067	0.221935	0.246915	0.093241	-0.005809	0.062089
14	0.011405	0.004019	0.072197	1.000000	-0.019250	0.108513	0.237540	0.070031	0.016830	0.223395
15	0.418014	0.476607	0.194067	-0.019250	1.000000	0.163123	0.025356	0.171840	0.081410	0.088628
16	0.168469	0.153627	0.221935	0.108513	0.163123	1.000000	0.370596	0.219777	0.087568	0.147221
17	0.043866	0.095136	0.246915	0.237540	0.026556	0.370596	1.000000	0.124462	0.022123	0.104052
18	0.150496	0.250203	0.093241	0.070031	0.171840	0.219777	0.124462	1.000000	0.364954	0.051529
19	0.018663	0.085151	-0.003809	0.016830	0.081810	0.087568	0.022123	0.364954	1.000000	0.050909
20	0.042370	0.040708	0.062089	0.223395	0.088620	0.149221	0.104052	0.051529	0.050909	1.000000
21	-0.025060	-0.011959	0.127016	0.082963	0.016074	0.004845	0.053250	-0.055498	0.039910	0.015658
22	0.085515	0.040074	0.036490	0.043301	0.049070	-0.018459	0.037271	0.186559	0.041540	0.113748
23	0.085267	0.088344	0.227354	0.230633	0.028124	0.254965	0.411957	0.258173	0.003150	0.166306
24	-0.072295	-0.016590	0.039997	-0.025592	-0.028626	0.024947	0.054225	0.042833	-0.010683	-0.178779
25	0.578030	0.575850	0.233451	0.062419	0.399691	0.142931	0.202751	0.179617	-0.007170	0.101380
26	0.642936	0.530474	0.215766	0.031115	0.311403	0.210520	0.111154	0.228636	0.112773	0.085200
27	0.321968	0.364521	0.261025	0.072183	0.264991	0.173030	0.091477	0.115730	0.056915	0.201269
28	0.333762	0.295921	0.443264	0.043110	0.362198	0.276720	0.188064	0.147151	-0.054119	0.086100
29	0.021540	0.100620	-0.300579	0.031460	0.077653	0.055535	0.097252	0.172550	0.183842	0.086512
30	0.114924	0.146518	-0.065777	0.093248	0.074003	0.232990	0.017775	0.121297	0.053068	0.049148
31	-0.070057	-0.059987	-0.013771	-0.012154	-0.122278	-0.014920	-0.003594	-0.033191	0.052749	-0.005351
32	0.017475	0.017150	0.069433	0.070309	-0.006355	0.113271	0.215411	0.010979	-0.017455	-0.194272
33	0.014137	0.087338	0.027805	0.011660	0.006382	0.074041	-0.012589	0.010643	0.103939	-0.102103
34	-0.036830	0.020481	0.104161	-0.057190	0.066268	0.110779	0.046213	0.071278	0.018635	0.050717
35	-0.004594	-0.010374	-0.019861	-0.004342	0.015177	0.004100	0.002139	-0.012363	0.056924	0.010243
36	-0.063949	-0.006523	0.014231	0.218546	-0.057698	0.147225	0.210411	0.079170	0.040655	0.117711
37	-0.021169	-0.038620	0.036831	-0.036124	0.045573	0.065266	-0.065727	0.074506	0.030239	0.119657
38	-0.006131	0.010602	0.054290	0.193389	0.044618	0.139046	0.121244	0.180714	0.116815	0.161327
39	-0.087561	-0.022660	0.213385	0.266870	-0.070432	0.150959	0.156978	0.120457	-0.044719	0.055569
40	-0.037550	-0.024910	0.152415	0.269329	0.004818	0.213160	0.247187	0.260420	-0.032586	0.245133
41	0.030314	0.075666	-0.157795	0.010796	0.011902	-0.002990	-0.034732	-0.056361	-0.050331	-0.109044
42	-0.090840	-0.062212	0.030776	0.386009	-0.029622	0.274715	0.314437	0.171782	0.061075	0.225942
43	-0.117470	-0.136656	-0.035947	0.105087	-0.117566	0.081779	0.140036	-0.175661	-0.076466	-0.057199
44	-0.084827	-0.072336	0.008840	-0.014092	-0.099518	-0.045011	-0.012395	-0.039070	0.053630	-0.135458
45	0.042994	-0.025245	-0.011742	-0.039922	-0.054128	0.062395	-0.082338	0.034367	-0.015393	0.117478
46	0.015335	-0.027052	-0.156306	-0.048524	0.004841	0.006323	0.083082	-0.064758	0.083501	-0.074316
47	0.025957	-0.004587	-0.052610	-0.197623	-0.043583	-0.157413	-0.176151	-0.240013	-0.127914	-0.183276
48	-0.110033	-0.067045	0.070298	0.036201	-0.132216	0.005071	0.013218	0.102561	-0.019407	-0.006355
49	-0.011659	-0.006630	0.106824	-0.207298	-0.032185	-0.073270	-0.068152	-0.040112	-0.028734	-0.076459
50	0.071502	0.067065	-0.127587	0.043083	0.056579	-0.005035	-0.037087	0.055081	0.077564	-0.015104
51	0.032905	-0.013055	0.031052	-0.073874	0.002323	0.013045	0.031138	-0.150099	-0.053171	-0.221973
52	0.014450	-0.006515	0.042445	-0.053746	-0.036141	-0.062239	0.035661	0.020901	0.033172	-0.001662
53	0.013030	0.006750	0.047466	0.328052	0.070254	0.204365	0.257507	0.200575	0.072787	0.219540
54	0.027200	0.008492	0.115984	0.269079	0.036363	0.293069	0.270899	0.256167	0.108186	0.229223
55	-0.015313	0.041283	0.104690	0.377523	0.032259	0.264090	0.311223	0.215700	-0.006768	0.222030
56	0.011429	-0.010862	-0.015769	-0.193196	-0.024312	-0.125913	-0.109011	-0.254902	-0.122289	-0.251869
57	0.059956	0.062779	0.129818	0.126884	0.023260	0.110551	0.072570	0.151892	0.086304	0.149192
58	-0.028686	-0.052382	0.202065	0.150458	-0.082953	0.123570	0.074773	0.162030	0.002138	0.134789

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	21	22	23	24	25	26	27	28	29	30
1	0.022536	0.034157	0.137795	-0.073777	0.365160	0.204994	0.201886	0.355217	0.012858	0.119862
2	-0.100499	0.103465	0.314437	-0.144120	0.237724	0.139384	0.243100	0.178869	0.029330	0.074757
3	0.024546	0.152601	0.122879	-0.058549	0.822903	0.443352	0.373683	0.309441	0.224544	0.199747
4	-0.108147	0.045234	0.076115	-0.093377	0.085912	0.171251	0.023704	0.074720	-0.043204	-0.095284
5	-0.003151	0.012729	0.013920	-0.034531	-0.075987	0.094756	0.031183	-0.074664	-0.071473	-0.053402
6	0.008421	-0.006616	0.125942	0.076194	0.130226	0.105945	0.063840	0.013751	0.142060	-0.039740
7	0.099589	0.012911	0.005357	0.011174	-0.122045	-0.007867	-0.144242	-0.064831	0.011267	-0.140795
8	0.022621	0.069721	0.117168	0.006602	0.082900	-0.008079	0.122298	0.062730	-0.070329	0.087439
9	0.038078	-0.018259	-0.100395	0.056216	0.000144	0.083959	0.077948	0.066436	-0.064863	0.110338
10	0.137583	-0.005396	0.206853	-0.075409	0.187192	0.351981	0.249334	0.541344	-0.004183	0.056900
11	-0.025080	0.085535	0.086267	-0.072295	0.578030	0.442986	0.321968	0.339762	0.021540	0.118928
12	-0.011959	0.094074	0.088344	-0.016580	0.575850	0.530874	0.364521	0.295921	0.100620	0.146538
13	0.127916	0.036490	0.222358	0.039497	0.283451	0.235706	0.261025	0.440268	-0.000579	-0.065777
14	0.082963	0.063301	0.210633	-0.025592	0.062418	0.031115	0.072183	0.043110	0.031460	0.093248
15	0.016074	0.098070	0.028124	-0.028626	0.309601	0.911403	0.264991	0.362198	0.077653	0.079003
16	0.004895	-0.018459	0.254965	0.024987	0.142931	0.210520	0.173030	0.270720	0.009535	0.222980
17	0.053250	0.017271	0.311857	0.054225	0.202751	0.111158	0.091477	0.186664	0.097252	0.017775
18	-0.055998	0.146654	0.256173	0.042833	0.179617	0.228636	0.115730	0.147151	0.122590	0.121297
19	0.016510	0.041540	0.003150	-0.010683	-0.007170	0.112773	0.059415	-0.054119	0.163842	0.050048
20	0.015658	0.113746	0.166306	-0.178779	0.101380	0.085200	0.201269	0.086100	0.066912	0.049148
21	1.000000	-0.106950	-0.057624	0.045658	0.008889	0.013130	0.011318	0.115303	-0.054863	0.079883
22	-0.106950	1.000000	0.104701	-0.041784	0.154308	0.137824	0.114932	0.074705	0.034003	0.032654
23	-0.057624	0.104701	1.000000	0.051276	0.183680	0.024158	0.210153	0.116121	0.108573	0.067637
24	0.045658	-0.041784	0.051276	1.000000	-0.065208	0.007551	-0.114392	-0.005285	0.028915	-0.061485
25	0.008889	0.154308	0.183680	-0.065208	1.000000	0.446616	0.399236	0.369328	0.145044	0.145914
26	0.013130	0.137824	0.024158	0.007551	0.446616	1.000000	0.258748	0.330927	0.102281	0.101273
27	0.011318	0.114932	0.210153	-0.114392	0.399236	0.258748	1.000000	0.249598	0.075135	0.065281
28	0.115303	0.074705	0.116121	-0.005285	0.369328	0.330927	0.249598	1.000000	0.055563	0.036474
29	-0.054863	0.034003	0.108573	0.028915	0.145044	0.102281	0.075135	0.055563	1.000000	0.107332
30	0.079883	0.032654	0.067637	-0.061485	0.145914	0.101273	0.065281	0.036474	0.107332	1.000000
31	-0.021495	-0.175779	0.068507	-0.063160	-0.010473	-0.124286	0.103142	-0.055320	0.097772	0.109759
32	0.081949	0.031517	0.133486	-0.044818	0.045025	0.052539	0.057438	-0.037017	0.017542	0.027857
33	-0.060466	-0.110049	0.055123	-0.018488	0.067595	0.042554	0.097652	-0.069900	0.019803	0.124643
34	-0.062495	-0.017102	0.181946	0.043200	0.167152	0.071327	0.080133	0.004480	0.106509	0.072108
35	-0.000867	0.011179	0.070019	0.011310	0.009165	-0.010542	-0.007546	0.001768	0.028305	-0.000180
36	0.124165	0.059517	0.049767	-0.009687	-0.075406	-0.017400	0.044326	0.055581	0.032601	0.075852
37	0.013780	0.359717	-0.007589	-0.034240	0.024405	0.027748	0.075563	0.033658	0.034979	0.086134
38	0.075960	0.051671	0.072554	0.032649	-0.099118	0.060159	-0.023950	0.075372	-0.101231	0.139292
39	0.102624	0.073957	0.142658	-0.061765	0.034071	-0.042063	0.113640	0.127445	-0.042661	0.038515
40	0.084062	0.139022	0.148407	0.002346	-0.052099	0.037390	0.030785	0.173828	-0.005680	0.155465
41	0.039479	0.103424	-0.001173	0.122720	0.034127	0.031748	0.012149	-0.033401	0.033202	0.028353
42	0.058175	0.169111	0.196275	-0.064870	-0.114048	0.005706	0.056693	0.036918	0.001523	0.165443
43	-0.073950	0.051527	-0.010462	-0.044722	-0.160213	-0.171245	-0.161071	-0.043188	-0.144033	0.046438
44	0.043885	0.084425	-0.030173	0.059988	0.022872	-0.060515	-0.026086	0.007102	0.092947	-0.054509
45	0.045258	0.091451	0.030527	-0.189019	-0.021188	-0.104745	0.020159	0.015585	-0.204630	0.100532
46	-0.038310	-0.034283	-0.105097	-0.062756	-0.095411	-0.057021	0.006460	-0.067408	0.067692	0.033287
47	-0.119329	-0.039146	-0.071602	0.005591	-0.004041	-0.086127	0.055006	-0.078565	0.020593	-0.074065
48	0.064993	-0.074327	-0.012098	0.035632	0.028119	-0.134336	-0.010702	-0.030866	-0.130207	-0.021542
49	0.039538	-0.045812	-0.095573	0.007149	0.033766	-0.045681	0.030306	0.111604	-0.083842	-0.065308
50	0.125370	0.074880	-0.054922	0.086925	0.027743	0.051062	-0.000620	-0.039306	-0.027890	0.021492
51	-0.005256	-0.165046	-0.089550	-0.042982	0.070554	-0.025400	0.014908	-0.038528	0.067056	-0.065026
52	-0.048534	0.055148	0.028572	0.093935	0.012043	0.007216	0.053747	-0.041177	0.030391	-0.117404
53	0.058742	0.200591	0.171267	0.004646	-0.086552	0.114340	0.021550	0.067729	0.019631	0.130791
54	0.036297	0.221019	0.183599	0.045821	-0.040607	0.117526	0.103042	0.111625	0.038499	0.166190
55	0.075737	0.144736	0.243768	0.002465	0.040379	0.076542	0.116769	0.149761	0.075390	0.130809
56	-0.083072	-0.129175	-0.113540	-0.013571	0.084147	-0.060364	0.020884	-0.059454	0.066628	-0.125755
57	0.074357	-0.010112	0.121822	0.022549	0.061978	0.065803	0.075437	0.090493	0.115517	0.065837
58	0.106194	0.072735	0.099966	-0.076112	0.044196	-0.062528	0.074690	0.146926	-0.120135	0.043615

	31	32	33	34	35	36	37	38	39	40
1	0.092146	-0.015758	0.119841	0.043390	-0.020133	-0.031092	-0.006115	0.137557	0.222692	0.110920
2	0.104740	0.140931	-0.028404	0.065984	0.009443	-0.029077	0.006850	0.074594	0.157745	0.101534
3	-0.003522	0.071636	-0.037087	0.121221	-0.007466	-0.009925	0.057291	-0.130070	0.025299	-0.016709
4	0.017417	0.116774	-0.051693	-0.026149	-0.012577	-0.037151	-0.011390	-0.066613	0.027401	0.022214
5	-0.011273	0.131300	0.022786	-0.133109	0.074419	0.165452	-0.022247	0.111453	-0.145034	-0.072587
6	-0.105158	0.025990	-0.036756	0.049560	-0.001625	0.056049	-0.051779	-0.066058	-0.034877	0.265398
7	-0.124141	0.002145	0.038751	-0.006543	-0.006751	0.028720	-0.043061	-0.071572	-0.010339	0.021707
8	0.096866	-0.066175	0.052382	0.117526	-0.000392	0.049107	0.053678	0.077247	0.174484	0.103755
9	0.004458	0.006001	0.101669	0.011056	-0.036724	0.053116	0.098792	-0.002705	0.041274	-0.023918
10	0.097154	0.072828	-0.028095	-0.021176	0.010654	-0.007827	-0.006183	0.008346	0.152518	0.054560
11	-0.079057	0.017475	0.014137	-0.036030	-0.004594	-0.063949	-0.021169	-0.006331	-0.097561	-0.037550
12	-0.060467	0.017150	0.047858	0.020481	-0.010304	-0.006523	-0.034620	0.013602	-0.022660	-0.029310
13	-0.013771	0.069831	0.027995	0.104161	-0.019961	0.014211	0.036831	0.054290	0.213385	0.152415
14	-0.012154	0.479109	0.011660	-0.057190	-0.004342	0.218546	-0.036126	0.193109	0.266870	0.269329
15	-0.122278	-0.006355	0.036382	0.056268	0.015177	-0.057638	0.085673	0.044618	-0.070432	0.004518
16	-0.014920	0.113291	0.074041	0.110779	0.008100	0.147225	0.065266	0.134046	0.150959	0.213160
17	-0.003594	0.215411	-0.012589	0.046213	0.002139	0.210411	-0.065727	0.121244	0.156579	0.247127
18	-0.033191	0.010979	0.010643	0.071278	-0.012363	0.079170	0.074506	0.180714	0.170457	0.260620
19	0.092789	-0.017455	0.103939	0.018635	0.055424	0.040655	0.039239	0.118812	-0.044718	-0.032526
20	-0.005351	0.134272	-0.102103	0.050717	0.010243	0.117711	0.119657	0.161327	0.055969	0.245133
21	-0.023495	0.053948	-0.060464	-0.062495	-0.000867	0.104165	0.033780	0.075060	0.102624	0.068062
22	-0.175779	0.031517	-0.110089	-0.017102	0.011149	0.055517	0.050717	0.061671	0.073957	0.139022
23	0.068507	0.193496	0.055123	0.181946	0.070019	0.049767	-0.007589	0.072554	0.142558	0.149607
24	-0.063160	-0.044414	-0.014488	0.043200	0.011310	-0.005687	-0.036240	0.032649	-0.061765	0.002346
25	-0.010473	0.045325	0.067595	0.167152	0.008165	-0.075406	0.024405	-0.098118	0.034071	-0.052099
26	-0.124286	0.052519	0.042554	0.071327	-0.010542	-0.017400	0.027748	0.060159	-0.042663	0.037330
27	0.103142	0.057438	0.097652	0.080133	-0.007546	0.044126	0.075563	-0.023830	0.113840	0.030785
28	-0.055320	-0.037017	-0.099900	0.004480	0.001768	0.035581	0.035658	0.075372	0.127445	0.173928
29	0.097772	0.017542	0.019803	0.106509	0.028309	0.032601	0.034978	-0.101231	-0.042661	-0.305490
30	0.109759	0.027657	0.124641	0.072108	-0.009180	0.075852	0.060134	0.139292	0.039515	0.150465
31	1.000000	-0.092753	0.051177	-0.100730	-0.070688	-0.108999	-0.128611	-0.066656	0.119453	-0.202167
32	-0.092753	1.000000	0.007489	-0.108390	-0.001386	0.197107	-0.077493	0.165584	0.217255	0.240808
33	0.051177	0.007489	1.000000	0.175764	-0.005121	0.099990	-0.047121	-0.069693	-0.003451	-0.143575
34	-0.100730	-0.108390	0.175764	1.000000	-0.004595	0.111738	0.137602	-0.071158	-0.013604	-0.044307
35	-0.070688	-0.001386	-0.005121	-0.004595	1.000000	-0.004553	-0.007098	-0.057558	-0.053353	0.005641
36	-0.108999	0.197107	0.099990	0.111738	-0.004553	1.000000	0.002300	0.163649	0.048449	0.282746
37	-0.128611	-0.077493	-0.047121	0.137602	-0.007098	0.002300	1.000000	-0.002046	-0.045020	0.070820
38	-0.066656	0.165584	-0.069693	-0.073158	-0.057558	0.163649	-0.002046	1.000000	0.163008	0.274365
39	0.119453	0.217255	-0.003951	-0.013604	-0.053353	0.048449	-0.045020	0.163008	1.000000	0.334233
40	-0.202167	0.240808	-0.143575	-0.044007	0.005641	0.282746	0.070820	0.274365	0.334233	1.000000
41	-0.079890	-0.012771	-0.032361	0.036160	-0.012793	0.125166	-0.000525	-0.054977	-0.251634	-0.217228
42	-0.012383	0.128174	-0.058608	-0.042850	-0.003861	0.407926	0.036979	0.430027	0.412931	0.551422
43	-0.052499	0.091651	0.021299	-0.061157	0.002043	0.147560	0.048207	-0.015647	0.029356	0.073046
44	-0.013440	-0.017977	0.030767	-0.135212	-0.009833	-0.057663	-0.117564	-0.292109	0.293920	0.023720
45	0.014943	-0.037858	0.014558	0.047513	0.000164	0.065530	0.208160	0.203497	0.075126	0.110058
46	0.262642	-0.031759	-0.047630	0.010087	0.001379	0.152816	-0.006778	-0.029759	-0.174219	-0.167149
47	-0.016312	-0.177919	-0.012646	0.060060	0.004917	-0.232699	0.000322	-0.541951	-0.155670	-0.283189
48	0.106634	-0.051704	-0.008562	0.046599	0.000518	-0.078484	0.097705	0.104437	0.360638	0.076102
49	0.191152	-0.220482	0.053422	0.057338	0.008917	-0.253904	0.086096	-0.040185	0.103607	-0.253556
50	-0.034801	0.025556	0.009279	0.015535	0.009964	0.133161	-0.026496	0.260772	-0.308478	-0.227366
51	-0.023172	-0.055898	0.022596	-0.015208	-0.004656	-0.095188	-0.046414	-0.451185	0.001204	-0.089061
52	-0.035343	-0.059721	-0.046046	-0.006354	0.002240	-0.050098	-0.096061	-0.156843	0.244295	0.152557
53	-0.176861	0.301011	-0.079975	-0.045108	-0.000540	0.338628	0.037859	0.309471	0.321063	0.642508
54	-0.135467	0.230439	-0.076707	-0.024033	-0.020360	0.284579	-0.011026	0.224049	0.345068	0.667895
55	-0.115515	0.309252	-0.037706	-0.003656	0.093194	0.499088	-0.000772	0.300751	0.420852	0.764453
56	0.032304	-0.153941	0.031842	0.028022	-0.059871	-0.187552	-0.066542	-0.758368	-0.135658	-0.252697
57	0.025691	0.089135	-0.081856	-0.079117	-0.048807	-0.299474	-0.036082	0.180499	0.454356	0.414108
58	0.114007	0.060206	0.045227	0.012589	0.104457	-0.016237	0.123831	0.226945	0.739118	0.287362

	51	52	53	54	55	56	57	58
1	-0.033416	-0.041717	0.031573	0.099549	0.015476	-0.099945	0.203006	0.253512
2	-0.018550	0.004510	0.114260	0.066384	0.104808	-0.110626	0.039522	0.219500
3	0.009209	-0.027153	-0.083560	-0.032509	0.043407	0.107515	0.012016	-0.000452
4	-0.077245	0.006679	0.148246	0.112044	0.015259	0.002303	-0.033714	0.023974
5	-0.153016	0.041880	0.069831	0.051092	0.053552	-0.116117	-0.123959	-0.127873
6	0.052061	0.086241	0.127764	0.204556	0.226401	0.063612	0.113425	-0.037051
7	0.106369	0.257328	0.010101	0.067825	0.040807	0.127748	0.052454	-0.042722
8	-0.106829	-0.061049	0.006286	0.043638	0.101444	-0.133532	0.043573	0.267808
9	0.112243	-0.079646	0.054750	0.033388	0.011765	0.036498	-0.015117	0.120901
10	0.047656	-0.067312	0.069901	0.116750	0.131714	-0.005581	0.175713	0.113566
11	0.042905	0.014450	0.013030	0.027200	-0.015343	0.011429	0.058956	-0.059686
12	-0.013055	-0.006515	0.006550	0.008492	0.041283	-0.019562	0.062779	-0.052322
13	0.031052	0.042435	0.047466	0.115984	0.104690	-0.015769	0.129818	0.202065
14	-0.073874	-0.053746	0.328052	0.269079	0.177521	-0.193146	0.126884	0.153458
15	0.002323	-0.036141	0.070254	0.036363	0.032259	-0.029312	0.023260	-0.082953
16	0.013045	-0.062230	0.284365	0.233069	0.264090	-0.125913	0.110551	0.173570
17	0.031138	0.035561	0.257507	0.270859	0.311221	-0.109411	0.072570	0.074773
18	-0.150099	0.020301	0.200575	0.256167	0.215700	-0.255902	0.151492	0.162030
19	-0.053171	0.033172	0.072787	0.100186	-0.000768	-0.122289	0.086304	0.002138
20	-0.221973	-0.001662	0.213940	0.229223	0.222030	-0.251669	0.149192	0.134780
21	-0.005256	-0.046534	0.054742	0.036297	0.078737	-0.083072	0.094357	0.106154
22	-0.165086	0.055148	0.200591	0.221019	0.144736	-0.129375	-0.010112	0.072735
23	-0.099550	0.028572	0.171267	0.183599	0.243768	-0.113540	0.121922	0.049316
24	-0.042982	0.031015	0.004746	0.045821	0.002465	-0.013571	0.022549	-0.078112
25	0.070554	0.012043	-0.086592	-0.040607	0.040379	0.084147	0.061478	0.044196
26	-0.025400	0.007216	0.114340	0.117526	0.075542	-0.060364	0.065803	-0.082528
27	0.014008	0.053747	0.021550	0.103042	0.110769	0.020684	0.073437	0.074650
28	-0.038528	-0.041177	0.067729	0.111625	0.149761	-0.055454	0.090493	0.145926
29	0.067056	0.010371	0.019631	0.038499	0.075190	0.066628	0.115517	-0.126135
30	-0.065086	-0.117404	0.130791	0.166190	0.130809	-0.125755	0.065837	0.043615
31	-0.023372	-0.035343	-0.176861	-0.135467	-0.115515	0.002304	0.025691	0.114807
32	-0.055898	-0.059721	0.101011	0.230439	0.109252	-0.153941	0.089135	0.062206
33	0.022596	-0.043046	-0.079876	-0.076707	-0.017706	0.031942	-0.091856	0.045227
34	-0.015208	-0.005354	-0.045104	-0.024033	-0.003656	0.024022	-0.079117	0.012585
35	-0.034656	0.002240	-0.200590	-0.020360	0.093194	-0.059471	-0.048887	0.104457
36	-0.099188	-0.350098	0.316629	0.284579	0.473098	-0.187552	-0.299476	-0.016237
37	-0.046414	-0.096061	0.039859	-0.011026	-0.000772	-0.066542	-0.036082	0.123421
38	-0.451185	-0.156843	0.309471	0.228049	0.300751	-0.758368	0.180499	0.226945
39	0.091204	0.244295	0.331063	0.395068	0.420492	-0.135698	0.454356	0.739118
40	-0.080061	0.152557	0.742504	0.667695	0.754453	-0.252597	0.414108	0.717102
41	0.031808	-0.197707	-0.050203	-0.152661	0.026699	0.097041	-0.143095	-0.363238
42	-0.276337	0.080451	0.718570	0.667735	0.763717	-0.416885	0.269624	0.329591
43	0.018311	0.017952	0.053150	0.052213	0.057420	0.011271	-0.345228	0.150315
44	0.221072	0.252555	0.096003	0.163774	0.084468	0.376353	0.211402	0.262718
45	-0.105021	-0.057934	-0.013992	-0.030390	-0.040381	-0.277918	-0.042810	0.479888
46	-0.013531	-0.037233	-0.067401	-0.120623	-0.177529	0.002788	-0.313953	-0.274887
47	0.533352	0.215347	-0.326874	-0.221835	-0.317922	0.787923	-0.146914	-0.351743
48	-0.065013	0.047714	-0.013619	0.002170	0.017882	-0.148700	0.106208	0.594033
49	-0.064309	-0.033915	-0.257510	-0.278650	-0.459372	-0.051804	0.011940	0.370095
50	-0.325618	-0.364487	-0.086633	-0.268970	-0.130416	-0.388490	-0.255897	-0.153117
51	1.000000	0.233609	-0.194355	-0.100509	-0.060420	0.794215	0.039818	-0.222303
52	0.233609	1.000000	0.109222	0.465734	0.125586	0.261593	0.189438	0.092358
53	-0.194355	0.109222	1.000000	0.803089	0.670722	-0.334930	0.331361	0.230252
54	-0.100509	0.465734	0.803089	1.000000	0.669440	-0.221443	0.405431	0.246020
55	-0.060420	0.125586	0.670722	0.669440	1.000000	-0.251185	0.363668	0.244588
56	0.794215	0.261593	-0.334930	-0.221443	-0.251185	1.000000	-0.098671	-0.364969
57	0.039818	0.189438	0.331361	0.405431	0.363668	-0.098671	1.000000	0.313168
58	-0.222303	0.092358	0.230252	0.246020	0.244588	-0.364969	0.313168	1.000000

APPENDIX D

FACTOR ANALYTIC RESULTS

PART III. Primary Factor Pattern Matrix, $\underline{P}$. (Note: Factors II, III, VII, and XII are reflected (i.e., all signs reversed) from original appearance.)

Estimates of uniqueness from Image analysis ($s^2_j = 1 - smc_j$)

.54	.51	.63	.71	.67	.42	.63	.48
.43	.48	.61	.58	.35	.45	.53	.68
.64	.78	.71	.58	.52	.42	.63	.48
.77	.73	.69	.66	.77	.73	.94	.61
.80	.46	.42	.33	.58	.26	.59	.53
.53	.69	.44	.66	.64	.49	.47	.62
.33							

Estimates of uniqueness from Principal Axis analysis ($\mu^2_j = 1 - h^2_j$)

.64	.39	.52	.77	.73	.13	.54	.40
.37	.39	.63	.54	.27	.44	.53	.68
.72	.84	.81	.55	.53	.42	.67	.48
.79	.84	.73	.72	.85	.79	.99	.66
.83	.43	.26	.20	.44	.22	.36	.44
.45	.82	.45	.72	.68	.40	.51	.64
.30							

I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	XIII
-0.1048	+0.2248	-0.0823	-0.0550	0.0051	0.1214	+0.2057	0.0459	0.1017	-0.0194	-0.0664	+0.0227	0.1829
-0.0083	-0.0360	-0.0099	-0.0534	0.0136	0.0286	+0.2522	-0.0421	0.1393	0.4543	-0.0553	+0.0461	0.0019
-0.2454	+0.0532	+0.0065	0.0109	0.0132	-0.0828	-0.1000	0.0476	-0.0844	0.5727	+0.0108	-0.0560	-0.0445
-0.3911	-0.1359	-0.1647	0.0301	-0.2358	-0.0167	+0.0157	-0.0689	-0.0924	0.0729	+0.0580	0.2591	0.2926
0.3921	+0.1729	+0.2794	-0.0453	-0.2159	-0.1965	+0.2575	0.2252	-0.0007	-0.0724	+0.0663	0.0301	-0.1250
0.0183	-0.0449	+0.0218	0.6983	-0.0029	0.0270	+0.0378	-0.0225	-0.0034	-0.0001	+0.0104	0.0098	0.0410
-0.0013	+0.0434	+0.0708	-0.0396	-0.0839	0.1212	+0.0632	0.4327	0.2189	0.0300	+0.1756	-0.1235	-0.0517
-0.1039	+0.0057	+0.0721	0.0496	0.6985	0.0805	-0.1956	0.0356	0.0440	0.0033	+0.0540	-0.0592	-0.0341
-0.0522	+0.5119	-0.0604	-0.2228	0.0885	0.0346	+0.0965	0.0164	-0.1233	0.0435	-0.0676	-0.0056	0.1134
-0.0546	+0.0499	-0.0452	0.0525	-0.0208	-0.0154	-0.0872	0.0202	-0.0389	-0.0503	-0.0196	-0.0480	0.7246
0.0301	+0.4020	-0.0071	0.0797	0.0248	0.0771	+0.1611	-0.0785	0.0541	-0.0170	-0.0653	+0.0416	0.0264
0.1300	+0.1590	-0.0548	0.0299	0.0899	-0.1946	-0.2313	-0.0046	-0.0394	0.1348	-0.0533	-0.0080	0.4760
0.0698	+0.0337	-0.0064	-0.0149	0.6661	-0.0470	+0.1311	-0.0212	-0.0151	0.0189	-0.0100	+0.0223	-0.0097
0.9	+0.1196	-0.0040	0.1005	0.0343	-0.0238	+0.6256	0.0071	-0.0813	-0.0023	+0.0078	-0.1454	-0.0510
0.1507	-0.1015	-0.2188	0.0696	0.0793	-0.1262	+0.0162	0.3503	-0.0159	0.0229	-0.1494	+0.1493	0.1913
-0.1377	-0.1314	-0.2323	-0.0533	0.1276	-0.0859	-0.0415	0.3569	-0.2174	-0.0633	+0.1720	+0.0067	0.1120
0.2698	-0.0901	-0.0948	-0.2216	-0.0372	-0.0623	+0.1300	-0.1019	0.1029	0.0877	-0.0344	+0.1538	0.0282
0.9497	+0.2834	-0.0378	0.0199	-0.0396	0.2021	-0.0262	-0.0328	-0.0064	-0.1882	+0.2229	-0.0027	-0.0809
0.2745	-0.0859	+0.0784	0.0602	-0.0402	0.0045	-0.1468	0.0860	0.1420	0.2049	+0.1639	-0.0046	0.1950
0.0054	-0.1473	+0.0213	0.0646	-0.0110	-0.0145	+0.5509	0.0070	0.0646	0.1329	+0.0012	+0.1425	0.0003
-0.0258	+0.0361	-0.0992	0.6096	0.0635	-0.0564	+0.0700	0.0430	-0.0175	-0.0228	+0.0243	+0.0411	-0.0569
-0.0661	+0.1062	+0.1521	-0.0343	-0.0777	0.0587	+0.1199	0.0191	0.0866	-0.0004	+0.0759	+0.0714	0.5343
-0.0276	-0.0899	+0.1303	-0.1031	0.0206	0.1715	+0.0850	-0.0484	0.0936	0.0006	+0.0821	+0.0962	0.4446
0.1645	+0.5807	-0.0161	-0.0126	0.0313	-0.0379	-0.0215	-0.0188	0.0325	-0.0063	+0.0455	+0.0153	0.0873
0.0571	-0.1548	+0.0986	-0.0590	-0.0105	-0.1061	+0.1987	0.1136	-0.1940	-0.0879	-0.0491	+0.1564	0.0753
0.0991	-0.1787	-0.0099	-0.1498	0.1946	0.0339	+0.0326	0.0237	0.0683	-0.1718	+0.0239	+0.0439	0.2104
-0.5339	-0.1053	-0.1492	-0.1737	0.0143	0.2853	+0.2052	0.0609	-0.1266	-0.0228	-0.0676	+0.0748	-0.0860
0.0760	-0.1003	-0.0946	-0.0107	-0.0149	0.1781	+0.1639	-0.1947	-0.1431	0.0983	+0.0981	-0.0494	0.0946
-0.2979	-0.2671	-0.0051	0.0396	0.1083	0.1447	+0.1274	0.0270	0.0314	-0.1445	+0.0432	-0.0725	0.2756
0.0323	-0.2442	+0.1549	0.0289	0.0913	-0.0656	+0.2634	0.0216	0.2377	-0.0902	+0.0339	+0.1779	0.0715
0.0405	-0.0167	+0.0215	0.0097	-0.0205	-0.0890	+0.0317	0.0201	0.0323	0.0215	+0.0196	-0.0250	0.0095
0.2739	-0.0642	-0.0083	-0.0381	0.0224	0.0270	+0.1664	0.0014	-0.0406	-0.1625	+0.2268	-0.2005	0.0950
0.2553	-0.0778	+0.0995	-0.0100	0.1305	-0.1513	-0.0908	-0.0142	0.3080	0.0210	+0.0083	+0.0915	0.0042
0.0747	+0.0510	-0.6654	0.0459	-0.0106	0.0426	-0.0742	-0.0471	0.0327	-0.0494	-0.0150	+0.0021	0.0100
0.0252	+0.0101	-0.0100	0.0108	0.0045	0.6890	-0.0162	-0.0110	0.0285	-0.0264	-0.0480	+0.0368	0.0236
0.9426	+0.0876	+0.0294	0.0067	-0.0365	-0.0329	+0.0192	0.0247	0.0754	-0.0779	-0.0918	+0.0256	-0.0731
-0.0125	-0.0442	+0.1668	0.0428	0.0426	0.0079	-0.0077	-0.0178	-0.0424	-0.0063	+0.5725	+0.0966	0.0361
0.4279	-0.1412	-0.2085	-0.0718	0.0500	0.2463	+0.0751	-0.0138	-0.0777	0.0263	+0.0718	-0.1003	0.0355
-0.2208	-0.0146	+0.0553	-0.0125	0.0345	-0.0625	+0.0915	0.0139	0.1550	0.0187	-0.1144	-0.5468	-0.0053
0.0356	+0.1277	+0.4082	0.0080	-0.0450	0.3859	-0.1425	0.2556	-0.1775	0.1399	+0.1195	-0.0228	-0.1510
0.0631	-0.0545	-0.0682	-0.0387	0.0286	0.0144	-0.0589	0.0309	0.5595	0.0221	-0.0141	-0.1561	0.0209
-0.2904	-0.0934	-0.0508	-0.1485	0.1049	-0.1790	+0.0859	0.0451	-0.1471	-0.0560	+0.0289	-0.2268	0.0327
-0.0409	-0.0662	+0.6477	0.0140	0.0085	-0.0375	-0.0299	-0.0694	0.0286	0.0201	+0.0200	+0.0145	0.0602
-0.1697	-0.0007	-0.1271	0.0783	-0.0001	0.3591	-0.0245	0.0585	0.1959	-0.0159	+0.1175	+0.0678	-0.1034
-0.3298	+0.1678	-0.0866	0.0671	-0.0197	0.1696	-0.0532	0.0119	0.2813	-0.0674	+0.0224	+0.0398	-0.0781
-0.2134	+0.0069	-0.3204	0.0357	0.0172	-0.1294	+0.0082	0.0482	0.0321	0.0095	+0.4399	+0.0254	0.0120
0.0361	+0.0124	+0.6438	-0.0134	0.1294	0.0281	+0.0484	-0.0438	-0.0512	-0.0988	-0.0735	-0.0615	0.0332
0.1432	-0.1533	+0.2295	0.2257	-0.1004	0.1729	-0.0562	-0.0023	-0.0873	0.0464	-0.2721	-0.0513	0.2118
0.0318	-0.0793	-0.0876	0.0215	0.0923	0.1087	-0.0648	-0.0147	-0.1114	0.0742	+0.0460	-0.0010	0.0451

PART IV. Primary Factor Structure Matrix, S. (Note: Factors II, III, VII, and XII are reflected (i.e., all signs reversed) from original appearance.)

I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	XIII
0.0895	+0.4659	-0.1219	-0.1761	0.2393	0.2295	+0.1942	0.2094	0.2267	0.2314	-0.1681	+0.2086	0.4208
0.1599	+0.2409	-0.1094	-0.2419	0.1751	0.2350	+0.4253	0.0929	0.1950	0.5475	-0.1777	+0.0824	0.2763
0.0983	+0.0993	-0.0111	-0.0942	0.0511	0.0992	+0.1244	0.0499	-0.0560	0.4962	-0.0334	-0.0114	0.1107
0.3443	-0.1549	-0.1354	-0.0274	-0.1774	-0.1014	-0.0030	-0.1020	-0.1206	0.0610	+0.1880	-0.1896	0.0348
0.2054	+0.0328	+0.0795	0.0438	-0.0577	0.0382	+0.2227	0.1753	-0.0940	0.0591	+0.0252	+0.0093	0.0917
0.6082	-0.0597	+0.1365	0.6928	-0.0759	-0.0165	-0.0396	0.0156	-0.2090	-0.1355	+0.0640	+0.0238	-0.1260
0.0925	+0.0530	-0.1234	-0.0675	0.0648	0.1829	+0.1364	0.4316	0.2371	0.1029	+0.0161	-0.0130	0.0902
0.0176	+0.1199	-0.0065	-0.0003	0.5972	0.1042	+0.0299	0.0922	0.0830	-0.0131	+0.0151	-0.0829	0.0550
0.1085	+0.5393	-0.0496	-0.1753	0.3320	0.2909	+0.4107	0.1465	0.0459	0.2949	-0.1613	+0.2356	0.9212
-0.0109	+0.4149	-0.0173	-0.0733	0.1470	-0.0667	+0.2016	0.1831	0.0180	0.1442	+0.0631	+0.2917	0.6589
0.1190	+0.5165	-0.0202	-0.0042	0.2256	0.2231	+0.3497	0.0641	0.1170	0.1942	+0.1918	+0.1866	0.3296
0.0401	+0.3896	-0.0423	-0.1000	0.1903	-0.1005	+0.1253	0.1123	0.0170	0.2284	+0.0402	+0.2331	0.5409
0.2897	+0.2943	-0.1865	-0.1128	0.7328	0.2134	+0.4286	0.1293	0.0351	0.1791	-0.0127	-0.0290	0.2954
0.3272	+0.2465	-0.1519	0.0402	0.2932	0.2381	+0.6360	0.0752	-0.1007	0.2393	-0.0282	-0.0981	0.2266
0.2539	+0.1393	-0.2716	-0.0085	0.2066	0.1370	+0.2632	0.4771	0.0613	0.1634	-0.0387	+0.2164	0.3280
0.0107	-0.0280	-0.1468	-0.0391	0.1329	0.0054	+0.0449	0.3527	-0.0690	-0.0247	+0.0006	+0.0793	0.1243
0.2834	+0.0744	-0.2607	-0.1037	0.0883	0.1421	+0.2714	0.0177	0.1253	0.2633	+0.0462	+0.0726	0.1868
0.0700	+0.1408	-0.0970	0.0465	0.0514	0.1051	+0.0249	-0.0098	-0.0174	-0.1256	+0.1206	+0.0027	0.0114
0.2105	+0.0040	-0.1058	-0.0177	0.0	0.0739	+0.0678	0.1505	0.0439	0.2265	+0.1028	+0.0158	0.1752
0.2229	+0.1476	-0.1221	-0.0234	0.1638	0.1820	+0.5397	0.1153	0.0341	0.1195	+0.0492	+0.1272	0.2514
-0.0086	-0.0106	+0.0222	0.6040	0.0118	-0.0563	+0.0048	0.0767	-0.1516	-0.1641	-0.1162	+0.0717	-0.0538
-0.0535	+0.5059	+0.0881	-0.1389	0.1366	0.0074	+0.3229	0.2052	0.1262	0.2384	-0.0130	+0.3892	0.5564
0.9478	+0.2943	+0.0078	-0.1339	0.1713	0.1073	+0.2734	0.1342	0.1034	0.2160	+0.0128	+0.2437	0.4806
0.1381	+0.4270	-0.0762	+0.0910	0.2656	0.1290	+0.3024	0.1031	0.1094	0.2303	-0.0673	+0.2242	0.4694
0.0237	+0.0014	+0.0923	-0.0033	0.0041	-0.0578	+0.1394	0.1348	-0.1862	0.0025	+0.0110	+0.1915	0.1534
0.1428	+0.0205	-0.1571	-0.1817	0.2444	0.0692	+0.1425	0.1174	0.0877	-0.0217	+0.0521	+0.0125	0.1829
-0.2076	+0.2218	-0.0954	-0.1555	0.0039	0.1108	+0.0845	0.0747	0.0563	0.0149	+0.1036	+0.0935	-0.0326
0.3344	-0.0219	-0.2109	-0.0616	0.1036	0.2264	+0.2813	-0.1086	-0.1848	0.2210	+0.0758	-0.1523	0.0710
-0.1225	-0.0492	+0.0326	0.0025	0.1013	-0.0022	+0.0535	0.0942	0.0604	-0.0748	+0.0029	+0.0119	0.0995
-0.0410	+0.0036	+0.0373	0.0006	0.0798	-0.0487	+0.1579	0.1123	0.1720	-0.0232	+0.0107	+0.1606	0.1205
0.0035	-0.0119	+0.0074	-0.0009	-0.0156	-0.0426	+0.0153	0.0084	0.0159	0.0173	+0.0097	-0.0124	0.0112
0.3864	-0.1949	-0.2739	-0.0299	0.1752	0.1170	+0.2400	0.0177	-0.1452	-0.0169	+0.2481	-0.2874	0.0419
0.0591	+0.0007	-0.0527	-0.0758	0.1087	-0.0334	-0.0141	0.0361	0.2436	0.0199	-0.0140	+0.0309	0.0390
0.3634	+0.0046	-0.6774	-0.0969	0.1433	0.1908	+0.1846	0.0701	0.1272	0.0539	+0.1502	-0.1063	0.0431
0.3834	+0.1555	-0.1342	-0.0437	0.1800	0.7060	+0.2551	0.1748	0.0710	0.2067	-0.3313	-0.0382	0.0306
0.7639	+0.0598	-0.3156	-0.0205	0.1924	0.4581	+0.3478	0.1374	-0.0498	0.1865	-0.1686	-0.1748	0.0547
-0.1354	-0.1010	+0.0325	0.1375	-0.0167	-0.2901	-0.0921	-0.0495	-0.1873	-0.1276	+0.5443	+0.0834	0.0604
0.7604	-0.1050	-0.5316	-0.1466	0.2781	0.5304	+0.4056	0.1129	-0.1261	0.2705	+0.0378	-0.3393	0.3315
0.1134	-0.1327	-0.0352	-0.0977	0.0883	0.0852	+0.0527	-0.0894	0.1269	0.0299	-0.1139	-0.5093	-0.1850
0.0462	+0.0554	+0.3366	0.1381	-0.0415	0.3135	-0.0437	0.2048	-0.2074	0.1275	-0.1822	+0.0187	-0.0691
0.0474	-0.0021	-0.2244	-0.2191	0.0963	0.1085	+0.0102	0.0863	0.5597	0.0559	+0.0956	-0.1470	-0.0250
-0.1198	-0.1561	-0.0201	-0.1149	0.0525	-0.2272	-0.0435	-0.0725	-0.0997	-0.1059	+0.1780	-0.1971	-0.0528
-0.3798	-0.0086	+0.6743	0.1331	-0.1645	-0.2273	-0.2353	-0.1606	-0.0995	-0.0390	-0.1279	+0.1118	-0.0474
0.0202	+0.0638	-0.0971	0.0087	0.0359	0.3348	+0.0247	0.1522	0.2728	0.0286	-0.2587	+0.0495	-0.0913
-0.3157	+0.1684	+0.0477	0.0073	-0.0400	0.0029	-0.1300	0.0443	0.3731	-0.1155	-0.1231	+0.1601	-0.0303
-0.1598	-0.0967	-0.3204	0.0134	0.0049	-0.3463	-0.0617	0.0247	0.0351	-0.1207	+0.5061	+0.0545	0.0736
-0.1890	+0.0921	+0.6167	0.1130	0.0332	-0.0322	-0.0694	-0.1062	-0.1491	-0.0952	-0.2418	+0.0159	-0.0181
0.1518	-0.0192	+0.2661	0.2266	-0.0951	0.2501	+0.0227	0.0463	-0.1749	0.0937	-0.3358	-0.0212	-0.0127
0.7695	-0.0522	-0.4048	-0.0249	0.2701	0.4583	+0.3383	0.1103	-0.2180	0.2715	+0.0231	-0.2369	0.0784

PART V. Correlations between Primary Axes, L. (Included are the correlations of the five higher-order factor variables with the 13 factors.) (Note: Factors II, III, VII, and XII are reflected (i.e., all signs reversed) from original appearance.)

a. Combined sexes.

CORRELATIONS

	1	2	3	4	5	6	7	8	9	10
1	1.000000	-0.007769	-0.457919	-0.044310	0.274270	0.544516	+0.451577	0.146977	-0.173998	0.304796
2	0.007769	-1.000000	-0.054031	0.081759	-0.307221	-0.162367	-0.367641	-0.133876	-0.168629	-0.248228
3	0.457918	-0.054031	-1.000000	-0.189357	0.194757	0.204435	+0.256850	0.152126	0.170017	0.114507
4	-0.044310	-0.081759	+0.189357	1.000000	-0.110730	-0.063335	-0.112903	0.031842	-0.263525	-0.258358
5	0.274270	+0.307221	-0.194757	-0.110730	1.000000	0.237758	+0.397424	0.179073	0.066525	0.133230
6	0.544516	+0.162367	-0.204435	-0.063335	0.237758	1.000000	+0.350383	0.241087	0.051161	0.314789
7	-0.451577	-0.367641	+0.256850	0.112903	-0.397424	-0.350383	-1.000000	-0.207409	0.010066	-0.419186
8	0.146977	+0.133876	-0.152126	0.031842	0.179073	0.241087	+0.207409	1.000000	0.132663	0.123005
9	-0.173898	+0.168629	-0.170017	-0.263525	0.066525	0.051161	-0.010066	0.132663	1.000000	0.037645
10	0.304756	+0.248228	-0.114507	-0.259358	0.133230	0.314789	+0.419186	0.123005	0.037645	1.000000
11	-0.060881	-0.206801	-0.270179	0.100301	0.000999	-0.406906	-0.074368	-0.061948	-0.194157	-0.164446
12	0.275681	-0.386348	-0.140079	-0.051167	0.067726	0.121800	-0.042348	-0.229714	-0.079617	-0.053957
13	0.100798	+0.613942	-0.068091	-0.208343	0.296198	-0.001071	+0.443300	0.295847	0.052718	0.343056
14	0.816006	-0.012528	-0.271769	0.054599	0.259842	0.550797	+0.354434	0.203221	-0.268385	0.273803
15	0.851324	+0.009648	-0.345099	-0.027993	0.250754	0.525941	+0.472257	0.137117	-0.248622	0.203655
16	-0.379702	+0.051425	+0.945242	0.153907	-0.106136	-0.171915	-0.208843	-0.166677	-0.250796	-0.112847
17	0.364990	+0.187567	-0.057876	0.045864	0.074471	0.484477	+0.152011	0.194674	-0.094385	0.115657
18	0.290529	+0.188435	-0.301006	-0.113425	0.158785	0.755864	+0.173983	0.329924	0.502675	0.214564

	11	12	13	14	15	16	17	18
1	-0.060881	-0.275681	0.100798	0.816006	0.851324	-0.379702	0.368990	0.290529
2	+0.206801	-0.386348	-0.613942	0.012528	-0.009648	-0.051425	-0.187567	-0.188435
3	+0.270179	-0.140079	0.068091	0.271769	0.345099	-0.945242	0.057876	0.301006
4	+0.100301	+0.051167	-0.208343	0.054599	-0.027993	0.153907	0.045864	-0.113425
5	+0.000999	-0.067726	0.296198	0.259842	0.250754	-0.106136	0.074471	0.158785
6	+0.406906	-0.121800	-0.001071	0.550797	0.525941	-0.171915	0.484477	0.755864
7	+0.074368	-0.042348	-0.443300	-0.354434	-0.472257	0.208843	-0.152011	-0.173983
8	+0.061948	+0.229714	0.255847	0.203221	0.137117	-0.166677	0.194674	0.329924
9	-0.194157	+0.079617	0.052718	-0.268385	-0.248622	-0.250796	-0.094385	0.502675
10	+0.164446	+0.053857	0.343056	0.273803	0.203655	-0.112847	0.115657	0.214564
11	+1.000000	-0.051830	0.067212	-0.153721	0.039086	-0.236613	-0.298294	-0.372666
12	+0.051830	-1.000000	-0.424125	0.186092	0.211987	-0.071610	-0.302340	0.043947
13	+0.067212	+0.424125	1.000000	0.130385	0.157310	-0.044205	0.095456	-0.017719
14	-0.153721	-0.186052	0.130385	1.000000	0.669440	-0.221443	0.405431	0.246020
15	+0.039086	-0.211987	0.157310	0.669440	1.000000	-0.251185	0.363668	0.244588
16	-0.236613	+0.071610	-0.044205	-0.221443	-0.251185	1.000000	-0.098671	-0.364969
17	-0.298294	+0.302340	0.095456	0.405431	0.363668	-0.098671	1.000000	0.313168
18	-0.372666	-0.043947	-0.017719	0.246020	0.244588	-0.364969	0.313168	1.000000

b. Males

CORRELATIONS

	1	2	3	4	5	6	7	8	9	10
1	1.000000	+0.045771	-0.439556	-0.100021	0.323207	0.524607	+0.529153	0.176006	-0.129496	0.380880
2	-0.045771	-1.000000	+0.022199	0.107537	-0.239444	-0.176812	-0.455576	-0.162732	-0.189446	-0.256396
3	0.439556	+0.022199	-1.000000	-0.294514	0.260899	0.184646	+0.237981	0.235823	0.232655	0.197476
4	-0.100021	-0.107537	+0.294514	1.000000	-0.132083	-0.107110	-0.188036	-0.093764	-0.333029	-0.310632
5	0.323207	+0.239444	-0.260899	-0.132083	1.000000	0.248876	+0.406951	0.225382	0.075380	0.146503
6	0.524607	+0.176812	-0.184646	-0.107110	0.248876	1.000000	+0.421352	0.220516	0.059636	0.380639
7	-0.529153	-0.455576	+0.237981	0.188036	-0.406951	-0.421352	-1.000000	-0.199815	-0.068822	-0.478462
8	0.176006	+0.162732	-0.235823	-0.093764	0.225382	0.220516	+0.199815	1.000000	0.199706	0.109310
9	-0.129496	+0.189446	-0.232655	-0.333029	0.075380	0.059636	+0.068822	0.199706	1.000000	0.036242
10	0.380880	+0.256396	-0.197476	-0.310632	0.146503	0.380639	+0.478462	0.109310	0.036242	1.000000
11	-0.077770	-0.197159	-0.319165	0.102564	-0.007359	-0.363226	-0.185144	-0.016183	-0.167988	-0.141979
12	0.198597	-0.333522	-0.083152	-0.110499	0.050001	0.095405	-0.015026	-0.288407	-0.055666	0.062093
13	0.121857	+0.652067	-0.150089	-0.221041	0.285756	0.040001	+0.405012	0.367619	0.142475	0.355431
14	0.796636	+0.015736	-0.220956	-0.000949	0.404284	0.532634	+0.430350	0.256296	-0.213775	0.326062
15	0.914223	+0.017631	-0.405279	-0.123334	0.310386	0.603500	+0.507060	0.194639	-0.147729	0.304519
16	-0.347415	-0.020583	+0.942421	0.233403	-0.165413	-0.130092	-0.194726	-0.246446	-0.306675	-0.176256
17	0.212409	+0.264105	-0.096530	0.034376	0.059119	0.288330	+0.095008	0.126718	0.160399	0.022316
18	0.299748	+0.198517	-0.367181	-0.158864	0.133022	0.754346	+0.200372	0.375035	0.510296	0.270765

	11	12	13	14	15	16	17	18
1	+0.077770	-0.198597	0.121857	0.796636	0.914223	-0.347415	0.212409	0.299748
2	+0.197159	-0.333522	-0.652067	-0.015736	-0.017631	0.020583	-0.264105	-0.198517
3	+0.319165	-0.083152	0.150089	0.220956	0.405279	-0.942421	0.096530	0.367181
4	+0.102564	+0.110499	-0.221041	-0.000949	-0.123334	0.233403	0.034376	-0.158864
5	-0.007359	-0.050001	0.285756	0.404284	0.310386	-0.165413	0.059119	0.133022
6	-0.363226	-0.095405	0.040001	0.532634	0.603500	-0.130092	0.288330	0.754346
7	+0.185144	-0.015026	-0.405012	-0.430350	-0.507060	0.194726	-0.095008	-0.200372
8	-0.016183	+0.288407	0.367619	0.256296	0.194639	-0.246446	0.126718	0.375035
9	-0.167988	+0.055666	0.142475	-0.213775	-0.147729	-0.306675	0.160399	0.510296
10	-0.141979	-0.062093	0.355431	0.326062	0.304519	-0.176256	0.022316	0.270765
11	+1.000000	-0.067652	-0.006646	-0.149722	-0.065060	-0.300949	-0.441923	-0.268248
12	+0.067652	-1.000000	-0.391463	0.071774	0.197667	-0.046693	-0.529193	-0.016204
13	-0.006646	+0.391463	1.000000	0.170339	0.106352	-0.124527	0.140565	0.080882
14	+0.149722	-0.071774	0.170339	1.000000	0.725058	-0.157848	0.224484	0.242795
15	-0.065060	-0.197667	0.106352	0.725058	1.000000	-0.289338	0.220756	0.334091
16	-0.300949	+0.046693	-0.124527	-0.157848	-0.289338	1.000000	-0.090655	-0.410953
17	-0.441923	+0.529193	0.140565	0.224484	0.220756	-0.090655	1.000000	0.318847
18	+0.268248	+0.016204	0.080882	0.242795	0.334091	-0.410953	0.318847	1.000000

c. Females

CORRELATIONS

	1	2	3	4	5	6	7	8	9	10
1	1.000000	-0.375160	-0.477323	0.024414	0.208608	0.572374	+0.350501	0.108792	-0.220541	0.208444
2	0.375160	-1.000000	-0.154205	0.051623	-0.401963	-0.142804	-0.287527	-0.053815	-0.139463	-0.234865
3	0.477323	-0.154205	-1.000000	-0.056310	0.101908	0.222050	+0.283289	0.044775	0.040328	0.008575
4	0.024414	-0.051623	+0.056310	1.000000	-0.090442	-0.013877	-0.013145	0.194871	-0.172217	-0.198383
5	0.208605	+0.401963	-0.101908	-0.090442	1.000000	0.222545	+0.302936	0.112288	0.053862	0.113650
6	0.572374	+0.142804	-0.222050	-0.013877	0.222545	1.000000	+0.270155	0.271180	0.043082	0.237520
7	-0.350501	-0.287527	+0.283289	0.013145	-0.302936	-0.270155	-1.000000	-0.213315	0.113091	-0.337750
8	0.108792	+0.053815	-0.044775	0.194871	0.112288	0.271180	+0.213315	1.000000	0.045395	0.139139
9	-0.220541	+0.139463	-0.040328	-0.172217	0.053862	0.043082	-0.113091	0.045395	1.000000	0.038819
10	0.208444	+0.234865	-0.008575	-0.198383	0.113650	0.237520	+0.137750	0.139139	0.038819	1.000000
11	-0.039531	-0.217613	-0.204293	0.096562	0.013221	-0.460553	+0.073606	-0.121259	-0.226795	-0.192753
12	0.361643	-0.449566	-0.209851	0.022300	0.091190	0.157020	-0.078879	-0.155907	-0.108467	-0.195151
13	0.072847	+0.557463	+0.034515	-0.189152	0.108847	-0.044891	+0.486686	0.198102	-0.083101	0.323038
14	0.834940	-0.042885	-0.322284	0.110410	0.104061	0.568358	+0.281926	0.153560	-0.324108	0.222143
15	0.782823	+0.002287	-0.287017	0.079276	0.184693	0.469903	+0.426374	0.069701	-0.362167	0.091291
16	-0.419930	+0.147018	+0.547238	0.048257	-0.023234	-0.227257	-0.218625	-0.057767	-0.175686	-0.028206
17	0.556690	+0.084704	-0.095658	0.059341	0.094075	0.708705	+0.230718	0.282490	-0.412389	0.233995
18	0.274733	+0.177048	-0.221028	-0.050591	0.194395	0.791752	+0.125487	0.265367	0.491331	0.138291

	11	12	13	14	15	16	17	18
1	-0.039531	-0.361643	0.072847	0.834980	0.782823	-0.419930	0.556690	0.274733
2	+0.217613	-0.449566	-0.557463	0.042885	-0.002287	-0.147018	-0.084704	-0.177048
3	+0.204293	-0.209853	-0.034515	0.322284	0.287017	-0.547238	0.095658	0.221028
4	+0.096562	-0.022390	-0.189152	0.110410	0.079276	0.048257	0.059341	-0.050591
5	+0.013221	-0.091390	0.108847	0.104061	0.184693	-0.023234	0.094075	0.194395
6	-0.460553	-0.157020	-0.044891	0.568358	0.469903	-0.227257	0.708705	0.791752
7	-0.073606	-0.078879	-0.486686	-0.281926	-0.426374	0.218625	-0.230718	-0.125487
8	-0.121258	+0.155907	0.198102	0.150560	0.064701	-0.057767	0.282490	0.265367
9	-0.226795	+0.108467	-0.083101	-0.324108	-0.362167	-0.175686	-0.412389	0.491331
10	-0.192753	+0.195151	0.323038	0.222143	0.091291	-0.028206	0.233995	0.134291
11	+1.000000	-0.030438	0.164109	-0.158842	0.156289	-0.147491	-0.107605	-0.517586
12	+0.030438	-1.000000	-0.461832	0.297823	0.223217	-0.099064	-0.024379	0.114426
13	+0.164109	+0.461832	1.000000	0.091455	0.209134	0.064250	0.040656	-0.154568
14	-0.158842	-0.297823	0.091455	1.000000	0.624907	-0.291224	0.586392	0.258422
15	+0.156289	-0.223217	0.209134	0.624907	1.000000	-0.198991	0.530626	0.127110
16	-0.147491	+0.099064	0.064250	-0.291224	-0.198991	1.000000	-0.114857	-0.290683
17	-0.107605	+0.024379	0.040656	0.586392	0.530626	-0.114857	1.000000	0.319419
18	-0.517586	-0.114426	-0.154568	0.258422	0.127110	-0.290683	0.319419	1.000000

PART VI: Higher-order Factor Analyses.

a. Cattell-White Hierarchical Analysis
b. Hendrickson-White Hierarchical Analysis
c. Schmid-Leiman Hierarchical Analysis

a. First-order Solution: Cattell-White Analysis

	1	2	3	4	5	6	7	8	9	10	11	12	13
1	-0.09038	0.40603	0.06935	-0.00374	0.14926	-0.04997	0.17724	0.02313	-0.00125	0.03411	0.02798	0.06966	0.04713
2	-0.03567	0.05958	0.01633	0.03976	0.05947	-0.05522	0.36582	0.09209	0.44457	-0.05741	0.04047	0.02247	0.0107[illegible]
3	0.01089	0.02747	-0.00152	0.07808	-0.10008	-0.01411	0.07499	-0.06413	0.54350	0.01669	0.03098	0.07238	-0.10471
4	0.07117	0.08200	0.13718	-0.23101	-0.10183	0.02642	0.00992	-0.05279	0.05678	-0.05347	0.18618	-0.01685	0.14352
5	0.10904	0.06442	-0.10212	-0.20036	-0.17514	-0.03270	0.21716	0.01109	-0.06581	0.09227	0.05185	0.23178	-0.25712
6	-0.01489	-0.06425	-0.01181	0.01133	0.02111	0.71719	0.14264	-0.02065	-0.01973	-0.00613	-0.01087	-0.04366	0.04058
7	-0.01096	0.01002	0.02077	-0.04538	0.32652	-0.04071	0.06390	0.18237	0.04958	0.21571	0.13633	0.52544	-0.00174
8	0.06120	-0.00612	-0.12470	0.71773	0.01111	0.05460	-0.17709	0.06457	0.04781	0.05675	0.06160	0.01473	0.11249
9	-0.07149	0.61200	0.02419	0.09954	0.06104	-0.03800	0.09214	-0.17125	0.06200	0.02611	-0.00764	-0.01075	-0.11170
10	-0.34730	0.67000	0.00282	-0.05174	-0.02712	0.05068	-0.11016	-0.00474	-0.06229	0.12401	0.01657	-0.02342	0.21522
11	-0.34739	0.41913	0.00675	0.03338	0.14475	0.07779	0.16320	-0.02019	-0.01027	-0.09748	-0.00556	-0.05939	-0.10943
12	-0.01286	0.54291	0.03511	0.04256	-0.14569	0.01074	-0.17553	0.04268	0.10981	0.11187	-0.01290	-0.07607	-0.00693
13	0.20401	0.09536	-0.04976	0.65796	-0.05249	0.01669	0.17052	0.03708	0.06516	0.07086	0.02532	-0.00493	0.03960
14	0.10458	0.13031	-0.00552	0.03642	-0.05716	0.15006	0.61185	-0.12446	0.04111	-0.02699	0.17969	0.03429	0.00487
15	0.10751	0.10830	0.19746	0.34648	0.01790	0.09036	0.04219	0.03933	0.02602	0.47544	-0.09809	0.17357	-0.00143
16	-0.02077	0.00806	0.14464	0.09655	-0.00230	-0.03141	-0.06158	-0.15640	-0.03501	0.49097	-0.01650	0.14885	0.10340
17	0.21905	-0.00525	0.12112	-0.07001	0.01791	-0.21765	0.11717	0.12287	0.07156	-0.03415	-0.12570	-0.10155	-0.08162
18	0.10463	0.15571	0.09146	-0.01110	0.04545	0.01894	-0.07972	-0.07404	-0.17977	-0.13833	-0.06864	0.05812	-0.07520
19	0.21654	0.06422	0.00111	-0.05551	-0.06533	0.04170	-0.07436	0.17955	0.16699	0.02476	-0.01300	0.15964	-0.04084
20	0.53143	-0.02356	0.00607	-0.03522	-0.02952	0.11142	0.57342	0.00753	0.14927	0.01096	-0.35230	0.01455	0.06772
21	-0.07621	-0.05279	0.11130	0.07705	-0.07084	0.61053	0.16322	-0.03796	-0.02553	0.07400	-0.05109	-0.01199	-0.00761
22	-0.13805	0.61144	-0.12404	-0.09149	-0.00943	-0.23165	0.09123	0.03744	-0.00381	0.00667	-0.06221	0.05714	0.16192
23	0.04101	0.35644	-0.11936	0.00164	0.09185	-0.03424	0.05265	0.05126	-0.00327	-0.03528	-0.08769	0.00142	0.21375
24	-0.00765	0.63606	0.05109	0.05506	-0.02739	-0.02890	-0.01668	-0.00208	-0.00697	-0.06527	-0.02396	0.01178	-0.22931
25	0.02059	-0.01008	-0.10814	-0.05007	-0.09293	-0.05478	0.14762	-0.17009	-0.07364	0.70441	-0.12414	-0.02077	0.03541
26	0.17657	0.04872	-0.00361	0.15384	0.02874	-0.13370	-0.03253	0.10665	-0.15414	0.08164	-0.02020	0.00265	0.14258
27	-0.23233	-0.08304	0.07685	-0.03741	0.22569	-0.15278	0.14842	-0.23816	0.01675	0.08297	-0.07071	0.02265	0.24265
28	0.34732	-0.00055	0.07222	-0.01068	0.07170	0.00044	0.16939	-0.13940	0.08904	-0.16066	-0.00741	-0.17637	0.06805
29	-0.10359	0.02597	-0.05704	0.08053	0.11673	0.06716	0.07825	0.01834	-0.11711	0.07405	0.08814	0.01725	0.34819
30	-0.09371	-0.09192	-0.10508	0.05656	-0.05580	0.06108	0.24134	0.21290	-0.07464	0.02446	-0.07592	0.02970	0.13088
31	-0.02028	-0.00621	-0.01425	-0.02267	-0.05963	0.01001	0.03943	0.04667	0.02029	0.01842	0.04253	0.01573	-0.02008
32	0.42324	-0.00120	0.04285	0.03438	-0.12649	-0.01561	0.10482	0.01052	-0.14609	-0.05735	0.14007	0.07769	0.02162
33	0.04089	-0.06656	-0.03151	0.12128	-0.06560	-0.01894	-0.05447	0.74980	0.00737	-0.02262	-0.00570	0.01505	-0.07367
34	0.26683	0.02511	0.03217	-0.02921	0.08506	0.05424	-0.03261	0.04549	-0.05449	0.06759	-0.01456	-0.06702	-0.03381
35	0.38308	0.04155	-0.02620	0.02729	0.70478	-0.00083	-0.03789	-0.07975	-0.03425	-0.06727	-0.05354	0.38172	0.10386
36	0.69813	-0.01508	0.01519	-0.03276	0.10887	-0.00310	0.00883	0.16833	-0.10729	0.03598	0.00913	0.01261	-0.34440
37	0.02343	-0.01927	-0.02682	0.07356	-0.44603	0.06040	0.00089	-0.06302	-0.05263	-0.15831	-0.21921	0.09768	0.06074
38	0.75506	-0.11102	0.19607	0.06082	0.22631	-0.06623	0.06649	-0.01065	0.01695	0.60636	0.05789	0.03237	-0.03049
39	0.04985	-0.06292	-0.10529	0.06489	0.53369	-0.02901	0.09330	0.20850	0.07951	-0.09137	0.57916	0.12717	0.04754
40	0.11660	-0.01716	-0.37117	0.02335	0.25132	-0.01718	-0.10236	-0.24248	0.12470	0.06496	-0.06364	0.20553	-0.06829
41	-0.04202	-0.04054	0.11810	0.01568	0.12744	-0.00500	-0.04294	0.84293	0.01790	-0.08236	0.27337	0.18909	0.03190
42	-0.08911	-0.05202	0.00138	0.09712	-0.25964	-0.12967	0.04630	-0.06839	-0.02002	0.06567	0.19147	0.01302	0.11620
43	-0.25481	0.00233	-0.61266	0.02235	-0.66993	0.00052	-0.02005	0.01973	0.01363	-0.16165	0.09066	-0.02604	0.05376
44	-0.04385	-0.07568	0.10644	0.00372	0.45384	0.06562	-0.01914	0.04099	-0.01465	0.02196	-0.01240	0.10263	0.08205
45	-0.37926	0.08957	0.10178	-0.01301	0.19545	0.05266	-0.05960	0.15762	-0.05767	-0.00851	0.01389	0.08931	0.07118
46	-0.13605	0.00499	0.41124	0.02630	-0.47972	0.06602	0.02026	0.00812	0.02492	-0.00359	-0.11069	0.11216	0.07458
47	-0.09685	0.05061	-0.65515	0.14190	0.06141	-0.02000	0.02265	-0.04622	-0.04487	-0.11473	0.08100	-0.03373	0.03554
48	0.17076	0.02041	-0.29836	-0.09930	0.36032	0.20600	-0.02362	-0.05638	0.01485	0.05607	0.06461	-0.05431	0.06250
49	0.78695	-0.06467	0.09422	0.10646	0.13300	0.01663	-0.02951	-0.00571	0.04484	0.04004	-0.04212	-0.02453	-0.16788

a. Second-order Solution: Cattell-White Analysis

	1	2	3	4	5
1	-0.17488	-0.12858	-0.02772	-0.20233	0.97714
2	0.45098	0.06603	-0.00329	0.07317	0.18308
3	-0.17737	-0.18367	0.41365	0.44269	0.07481
4	-0.01147	0.21165	0.43352	0.20769	-0.01928
5	0.04451	0.58419	0.00257	0.08745	-0.17957
6	0.21037	0.22728	0.11298	-0.91213	0.16191
7	0.13031	0.25956	0.03185	0.27629	0.29413
8	0.30209	-0.09871	-0.21030	0.43159	-0.14114
9	0.09165	-0.12730	-0.30375	0.07727	0.07788
10	0.11618	0.08964	-0.53212	0.07259	0.11990
11	-1.01586	0.17848	-0.16394	0.24320	0.16837
12	0.36437	-0.09115	0.66956	-0.25673	0.03690
13	0.19949	-0.96267	0.09473	0.31179	0.06433

a. Third-order Solution: Cattell-White Analysis

	1	2
1	0.64128	-0.20087
2	0.51692	0.21218
3	0.06023	0.75186
4	0.88346	0.10430
5	0.55106	-0.11327

b. First-order Solution: Hendrickson-White Analysis

VARIABLE	1	2	3	4	5	6	7	8
1	0.5369	-0.1014	0.0952	0.1986	-0.0902	0.0079	0.0005	0.0036
2	0.1163	-0.2026	0.0243	0.1224	-0.1371	0.0486	0.3112	0.6482
3	0.0225	0.0086	-0.0339	-0.0699	-0.0325	0.1370	-0.1151	0.8346
4	0.0546	0.1390	0.1503	-0.2028	0.0087	-0.3880	-0.1855	0.0117
5	0.1258	0.1276	-0.2124	-0.2189	-0.0412	-0.3238	0.1715	-0.1470
6	-0.0896	0.0091	-0.0230	0.0658	0.9097	0.0412	0.1632	-0.0525
7	-0.0116	-0.0322	0.0196	0.1200	-0.0525	-0.0389	0.0733	0.0759
8	0.0611	0.3830	-0.1672	0.0454	0.0815	0.9004	-0.0921	0.0849
9	0.7971	-0.0624	0.0034	0.0753	-0.0955	0.1404	-0.1759	0.0699
10	0.7150	-0.0913	-0.0132	-0.1508	0.0066	-0.0427	-0.1012	-0.0725
11	0.6041	-0.0448	-0.0022	0.1999	0.1638	0.0459	0.0754	-0.0414
12	0.6429	-0.0555	0.0243	-0.2460	-0.0207	0.1262	-0.1748	0.1233
13	0.2258	0.2795	-0.0345	-0.0249	0.0663	0.7528	0.1678	0.1256
14	0.2360	0.2052	0.3325	-0.1249	0.2059	0.0668	0.3263	0.1047
15	0.1370	0.1425	0.2825	0.0701	0.1667	0.0490	0.1134	0.0558
16	0.0389	0.0364	0.1801	-0.0287	-0.0081	0.1281	-0.1407	-0.0923
17	0.0401	0.3378	0.1908	0.0593	-0.3579	-0.2036	0.2293	0.0623
18	0.2502	0.1719	0.0948	0.1352	-0.0046	0.0083	-0.2405	-0.3821
19	0.0063	0.2496	0.3056	-0.0582	0.0386	-0.0421	0.0129	0.3060
20	0.0257	0.0975	0.0524	0.0203	0.1931	-0.1141	0.6586	0.2566
21	-0.0483	-0.0795	0.1460	-0.0359	0.8683	0.0999	0.2052	-0.0563
22	0.6685	-0.1756	-0.1566	-0.3602	-0.0800	-0.0783	0.1783	0.0348
23	0.4187	0.0294	-0.1693	0.0788	-0.1837	-0.0383	0.1904	0.0082
24	0.7886	-0.1299	0.0594	-0.0117	-0.0075	0.0997	-0.1643	-0.0324
25	-0.0553	0.0564	-0.1331	-0.1967	-0.0914	-0.0811	0.3269	-0.1212
26	0.0015	0.2471	-0.0222	0.0351	-0.2524	0.2445	0.1620	-0.2432
27	-0.1199	-0.2880	0.0835	0.2737	-0.2355	-0.0225	-0.0707	0.0776
28	-0.0213	0.5048	0.0751	0.0423	-0.0286	-0.0124	0.3117	0.1573
29	-0.0361	-0.0973	-0.1348	0.1430	0.1261	0.1067	0.2842	-0.2119
30	-0.1664	-0.1104	-0.1126	-0.0262	0.1467	0.0628	0.7867	-0.0974
31	0.0288	-0.0432	0.0038	-0.0997	0.0454	-0.0979	0.0493	-0.0177
32	-0.0540	0.5626	0.3457	-0.1953	0.0031	0.0869	0.3905	-0.2230
33	-0.0938	0.0622	-0.3233	-0.0134	-0.0604	0.1858	0.3204	-0.0435
34	0.0412	0.3330	0.7862	0.1050	0.0677	-0.0424	-0.1325	-0.0879
35	0.0297	0.4358	-0.0828	0.7957	-0.0184	0.0762	-0.0828	0.0036
36	0.0190	0.8049	0.0511	0.2437	-0.0084	-0.0358	0.0174	-0.1587
37	-0.0660	0.0747	-0.0089	-0.4424	0.1410	0.0992	0.0985	0.0507
38	-0.1544	0.8704	0.2312	0.2102	-0.0802	0.0847	-0.0245	0.0405
39	-0.1167	0.1034	-0.1499	-0.0917	-0.0993	0.1531	-0.1056	0.0572
40	-0.0360	0.1371	-0.5322	0.3495	0.0126	0.0582	-0.2730	0.1881
41	-0.0516	-0.3742	0.1852	0.2337	-0.1730	0.0410	0.1165	-0.0021
42	-0.1011	-0.0950	0.0142	-0.5031	-0.2046	0.2308	-0.0961	0.0335
43	0.0795	-0.3335	-0.7470	-0.0927	-0.0114	0.0139	0.1016	0.0334
44	-0.1166	-0.0631	0.1264	0.6199	0.0858	0.0625	0.0687	0.0160
45	0.1566	-0.5239	[illegible]	0.2983	0.0778	-0.0371	0.0349	-0.1099
46	-0.0067	-0.1817	0.5539	-0.4917	0.1052	0.0280	0.0128	0.0570
47	0.0934	-0.1062	-0.8110	0.0211	-0.0395	0.2126	0.0095	-0.0953
48	-0.0103	0.2131	-0.4241	0.3595	0.2440	-0.1506	-0.0492	-0.0021
49	-0.0785	0.8914	0.1205	0.1491	0.0360	0.1254	-0.0643	0.0516

b. First-order Solution (Cont'd)

VARIABLE	9	10	11	12	13
1	0.0701	-0.1702	0.0634	0.0967	0.0827
2	-0.1320	-0.0425	0.0594	0.0282	-0.0587
3	-0.0261	0.0338	0.0175	0.0827	-0.2079
4	-0.0579	-0.0609	0.2587	0.0067	0.4635
5	0.0602	0.0300	0.1237	0.4524	-0.3808
6	0.0040	0.1075	-0.1055	-0.0648	0.1509
7	0.2724	0.0228	0.1782	0.0645	0.0049
8	0.2946	0.1327	0.1034	0.0023	0.0788
9	0.0196	-0.1861	0.0117	-0.0186	-0.1129
10	0.2243	0.1014	-0.0723	-0.0082	0.2886
11	-0.1727	-0.0396	0.0474	-0.0956	-0.0434
12	0.1857	0.3051	-0.0398	-0.1258	-0.0111
13	0.0789	0.0188	0.0984	-0.1246	0.0461
14	-0.0558	-0.2853	0.2422	0.0853	-0.0414
15	0.6678	0.0955	-0.0956	0.2306	0.0276
16	0.8092	-0.1955	0.0147	0.2094	0.1346
17	-0.0838	0.1168	-0.1312	-0.1467	-0.1197
18	-0.2491	-0.1024	-0.2278	0.1265	-0.0862
19	0.0689	0.5013	-0.0751	0.2292	-0.0892
20	-0.0441	-0.1576	-0.0344	0.0550	0.1254
21	0.0994	0.0496	-0.1174	-0.0136	0.0115
22	0.0188	0.0776	-0.1697	0.1012	0.1178
23	-0.0248	0.0318	-0.1556	0.0474	0.3166
24	-0.0829	0.1059	-0.0122	-0.0170	-0.2425
25	0.3738	-0.1469	-0.3093	-0.0609	-0.1221
26	0.1435	0.0245	-0.0948	0.0241	0.2473
27	0.1672	-0.7043	-0.1457	0.0795	0.2162
28	-0.2562	-0.1804	-0.0698	-0.2097	0.1671
29	0.1257	-0.2256	0.1366	0.0240	0.7950
30	-0.0702	0.1831	-0.0918	0.0487	0.1908
31	0.0391	0.0775	0.1798	0.0372	0.0522
32	-0.0711	0.0337	0.1518	0.1159	0.2238
33	-0.0897	0.6018	-0.0016	-0.0191	-0.1444
34	0.1359	-0.0276	-0.0222	-0.0883	-0.0136
35	-0.0422	-0.1747	-0.0802	0.1043	0.1204
36	0.0227	0.3010	0.0825	0.0188	-0.2638
37	-0.2235	0.1168	-0.4743	0.1638	0.0219
38	0.0499	0.0204	0.0707	0.0493	0.0346
39	-0.1286	0.0780	0.8534	0.2181	0.1526
40	0.0943	-0.1257	-0.1220	0.4267	-0.1256
41	-0.1297	0.3369	0.4047	0.3101	0.1192
42	0.1755	-0.1510	0.2852	0.0244	-0.0245
43	-0.2229	0.1227	0.0092	-0.0308	0.0905
44	0.0189	-0.0778	-0.0279	0.1355	0.0201
45	-0.0835	-0.0065	0.0586	0.1335	0.0422
46	0.0109	-0.0238	-0.2640	0.1882	-0.0081
47	-0.1567	-0.0097	0.1108	-0.0469	0.0523
48	0.1401	0.0727	0.1245	-0.0838	0.1864
49	0.0776	0.2060	-0.0320	-0.0477	-0.0936

b. Second-order Solution: Hendrickson-White Analysis

VARIABLE	1	2	3	4	5
1	0.3324	0.2429	0.1499	-0.0676	-0.1160
2	0.3268	0.2804	0.2257	-0.1929	0.2181
3	0.0803	0.2114	0.0150	-0.0690	0.4437
4	-0.3734	0.3726	0.0272	0.1553	0.6266
5	0.4670	-0.0516	-0.3991	-0.0468	-0.1565
6	0.0873	-0.3050	-0.3354	0.0317	0.1078
7	0.1118	0.0948	0.1580	0.2295	0.0274
8	0.0266	0.0060	0.1130	0.2198	-0.3257
9	0.4420	0.2523	-0.3647	-0.0328	-0.1345
10	-0.0445	0.6295	-0.1337	0.1236	0.1641
11	0.4435	0.0135	0.0216	-0.1252	-0.1468
12	-0.0748	0.5489	-0.0465	-0.0043	0.1261
13	0.4477	0.1462	0.3287	0.0979	-0.3002
14	0.8616	-0.1216	-0.2347	-0.0247	-0.0849
15	0.0881	0.4271	-0.0294	-0.1079	-0.0128
16	-0.0749	0.3042	-0.1504	-0.0524	-0.1340
17	0.1690	0.2991	0.2030	-0.1467	0.0607
18	0.1744	-0.1932	-0.3277	0.4100	-0.1411
19	-0.1379	0.3457	0.0737	0.0613	0.3816
20	0.5466	0.1972	-0.0919	-0.0781	0.0729
21	0.1707	-0.3082	-0.2778	0.0542	-0.0445
22	0.1008	0.6198	-0.1154	0.0951	0.0214
23	0.0331	0.5944	-0.0136	0.1398	0.1076
24	0.3436	0.1803	0.0078	0.0050	-0.1373
25	0.1220	0.3643	-0.4865	-0.1118	-0.2932
26	-0.0077	0.3256	0.0706	0.2075	-0.1969
27	0.0455	0.0598	0.0404	0.0302	-0.1506
28	0.3794	0.0308	-0.0803	0.1495	0.3345
29	-0.0974	0.1917	0.0372	0.1623	0.0311
30	0.0403	0.2143	0.3568	-0.3056	-0.2632
31	0.0086	-0.3018	0.0095	-0.0933	0.0578
32	0.3631	-0.0215	-0.1009	0.3502	0.1152
33	-0.1986	0.1353	0.3409	-0.0846	-0.1890
34	0.2093	-0.1001	0.4127	0.0682	0.1266
35	0.3013	-0.0531	0.1346	-0.1131	0.0030
36	0.5046	-0.0838	-0.0256	-0.2156	-0.0272
37	-0.1678	0.2207	-0.2550	0.7314	0.1891
38	0.4970	-0.3068	0.0785	0.0560	0.2172
39	0.2136	-0.4208	0.2780	-0.1202	0.0954
40	0.0491	0.0067	-0.3992	0.0408	0.0584
41	-0.1317	-0.0986	0.7593	-0.0379	0.0168
42	0.0271	-0.0403	-0.0915	0.1160	-0.1107
43	-0.3070	0.0931	-0.3433	-0.0603	-0.0553
44	0.0024	-0.1950	0.3835	-0.1742	-0.1571
45	-0.2121	-0.1663	0.4368	-0.0661	-0.2048
46	-0.1237	0.1094	0.1277	0.6254	0.1671
47	-0.0121	-0.0201	-0.4370	-0.0987	-0.2581
48	0.0187	0.0030	-0.3135	-0.4165	0.1602
49	0.4264	0.0589	-0.0808	-0.0099	0.1998

b. Third-order Solution

VARIABLE	1	2
1	0.5330	-0.0466
2	0.6379	0.2823
3	0.2490	0.3925
4	0.0015	0.3618
5	0.0662	0.0724
6	-0.3741	0.1745
7	0.2244	-0.1588
8	0.0591	-0.4354
9	0.4830	-0.0231
10	0.3090	0.3219
11	0.3855	0.3297
12	0.3348	0.0637
13	0.4502	-0.2527
14	0.4307	0.1355
15	0.3694	0.0554
16	0.0639	-0.0656
17	0.5029	0.1072
18	-0.0792	-0.3577
19	0.1860	0.1961
20	0.5185	0.0974
21	-0.2890	0.0372
22	0.4288	-0.0534
23	0.4234	-0.0486
24	0.3973	-0.3778
25	0.0430	-0.0471
26	0.2423	-0.3448
27	0.0970	-0.1473
28	0.2426	0.2296
29	0.0609	-0.1265
30	0.2169	-0.2262
31	0.0273	0.1138
32	0.1487	-0.0811
33	0.1768	-0.2061
34	0.3573	-0.3090
35	0.2964	0.3982
36	0.3511	0.2143
37	-0.2516	-0.3493
38	0.4299	0.1838
39	0.0716	0.1556
40	-0.2268	0.1165
41	0.3366	-0.1483
42	-0.0884	-0.1414
43	-0.3921	0.0292
44	0.1409	-0.0755
45	0.0120	-0.2344
46	-0.0269	-0.3666
47	-0.3034	-0.0320
48	-0.1233	0.4968
49	0.2783	0.2393

b. Fourth-order Solution from 49 variables

	Communalities	
1	0.183	-0.428
2	0.069	-0.263
3	0.011	0.106
4	0.071	0.266
5	0.000	0.005
6	0.164	0.405
7	0.084	-0.290
8	0.133	-0.365
9	0.140	-0.374
10	0.045	-0.212
11	0.069	-0.263
12	0.032	-0.178
13	0.275	-0.524
14	0.048	-0.218
15	0.054	-0.232
16	0.009	-0.096
17	0.085	-0.292
18	0.042	-0.206
19	0.000	0.008
20	0.056	-0.237
21	0.055	0.234
22	0.127	-0.356
23	0.120	-0.347
24	0.123	-0.351
25	0.004	-0.067
26	0.188	-0.434
27	0.033	-0.180
28	0.000	-0.010
29	0.019	-0.138
30	0.107	-0.327
31	0.004	0.062
32	0.029	-0.170
33	0.080	-0.283
34	0.073	-0.270
35	0.021	-0.146
36	0.010	-0.101
37	0.005	-0.072
38	0.033	-0.182
39	0.004	0.062
40	0.064	0.254
41	0.128	-0.358
42	0.002	-0.039
43	0.097	0.311
44	0.026	-0.160
45	0.033	-0.182
46	0.063	-0.251
47	0.040	0.201
48	0.210	0.453
49	0.004	-0.064
	3.275	3.275

b. Fourth-order Solution from 13 Image factors

1	0.191	0.437
2	0.290	-0.538
3	0.139	0.373
4	0.372	-0.610
5	0.240	0.490
6	0.180	0.425
7	0.451	-0.671
8	0.023	0.153
9	0.088	0.297
10	0.444	0.666
11	0.043	-0.207
12	0.002	-0.043
13	0.358	0.598
	2.822	2.822

c. Complete Solution (2 third-order, 5 second-order, and 13 first-order factors): Schmid-Leiman Analysis.

	1	2	3	4	5	6	7	8	9	10
1	0.38918	0.04678	0.16232	0.09473	0.03436	0.09032	0.01302	-0.04031	0.31743	0.05678
2	0.37119	-0.04453	0.07271	0.04563	-0.05562	0.12399	0.06910	-0.02002	0.04657	0.01257
3	0.09123	-0.07962	0.01350	0.01125	-0.06203	0.00569	0.08723	0.00558	0.02147	-0.00124
4	-0.09947	-0.06823	-0.12949	-0.23372	-0.03738	0.02175	0.13352	0.03647	0.00419	0.11225
5	0.07366	-0.06676	0.03470	0.14536	-0.04738	-0.08714	0.16757	0.05587	0.05036	-0.14911
6	-0.27692	-0.01556	0.12277	0.15234	0.05187	-0.28772	0.19404	-0.00763	-0.05023	-0.00967
7	0.14902	0.08665	0.09830	-0.01133	0.19254	0.02210	0.04110	-0.00561	0.00784	0.01701
8	0.10367	0.17673	-0.03279	0.03779	0.13897	0.04121	0.01732	0.03136	-0.00635	-0.10210
9	0.38314	0.04161	0.15250	0.18732	0.02059	0.05248	0.05450	-0.03663	0.47845	0.01381
10	0.22640	-0.15120	0.24155	-0.14971	-0.04135	0.02353	0.06340	-0.02424	0.82350	0.00231
11	0.28868	0.06075	0.17566	0.24176	0.03151	-0.00101	0.03726	-0.02428	0.32767	0.00563
12	0.20692	-0.14066	0.10850	-0.06435	-0.07072	0.02517	0.06113	-0.06650	0.42444	0.02875
13	0.37121	0.12619	0.00727	0.09781	0.09497	0.08363	0.22727	0.10453	0.07471	-0.04076
14	0.28282	0.06695	-0.03841	0.16198	0.04615	0.00244	0.31999	0.05358	0.10513	-0.06452
15	0.28725	-0.08420	0.18219	0.01024	-0.01782	-0.00060	0.16446	0.05690	0.08310	0.16167
16	0.08278	-0.03465	0.04644	-0.06684	-0.00596	0.02639	0.04497	-0.01904	0.00630	0.11847
17	0.31904	-0.06580	0.01672	-0.02778	-0.06660	0.11073	0.14224	0.11224	-0.00410	0.09917
18	-0.00047	0.14358	0.03895	0.65091	0.14315	-0.05575	0.06135	0.05361	0.12173	0.07469
19	0.09366	-0.09208	0.08922	-0.08252	-0.01458	-0.03762	0.17422	0.11096	0.05020	0.00091
20	0.32299	-0.04493	0.12370	0.04535	-0.00974	0.01034	0.18614	0.01613	-0.01842	0.00563
21	-0.19325	0.03672	0.11779	0.13438	0.08976	-0.23246	0.07341	-0.03305	-0.04127	0.09112
22	0.32500	-0.12268	0.33103	-0.08579	-0.02476	0.04221	-0.00776	-0.07074	0.47603	-0.10156
23	0.29515	-0.08949	0.22322	-0.12598	-0.01648	0.66759	0.05491	0.02101	0.27066	-0.09773
24	0.31621	0.05259	0.16658	0.19070	0.04419	0.00676	0.06156	-0.00792	0.47391	0.04163
25	0.07666	-0.12237	0.12176	-0.03949	-0.06579	-0.03413	0.06257	0.01075	-0.00852	-0.00254
26	0.19873	0.06709	0.02642	-0.11188	0.02065	0.09109	0.10762	0.09948	0.03809	-0.00296
27	0.07777	0.08247	0.04036	-0.06407	0.05354	0.10753	-0.17170	-0.11565	-0.08901	0.06292
28	0.11172	-0.00409	-0.09767	-0.03348	0.01610	0.00134	0.31850	0.17797	-0.00043	0.05913
29	0.02942	0.01091	0.03983	-0.13037	0.03170	0.05435	-0.04433	-0.09308	0.02030	-0.04671
30	0.14492	-0.03324	0.15090	-0.06024	0.00468	0.03948	-0.04321	-0.04249	-0.07156	-0.05601
31	0.00411	-0.02488	-0.01052	-0.00200	-0.02475	0.00587	0.08480	-0.01039	-0.00445	-0.01167
32	0.06675	0.06173	-0.14900	-0.09062	0.00492	-0.00946	0.39471	0.21687	-0.00190	0.03508
33	0.11137	-0.01228	0.03727	-0.00480	-0.01692	0.05369	-0.02809	0.02505	-0.05204	-0.02507
34	0.20953	0.13656	-0.09882	-0.04753	0.11343	0.09203	0.23557	0.13673	0.01963	0.51759
35	0.23529	0.10959	0.03665	0.21250	0.04752	-0.03068	0.19623	0.19629	0.07249	-0.02152
36	0.26563	-0.03238	-0.13949	0.20490	-0.04630	-0.07776	0.49457	0.35772	-0.01172	0.01244
37	-0.16758	0.02261	0.15809	-0.28695	0.13163	-0.09557	0.05761	0.01201	-0.01567	-0.09196
38	0.26423	0.05661	-0.19623	0.03932	0.05717	0.01132	0.58546	0.38770	-0.08742	0.16954
39	-0.03444	0.09905	-0.35442	0.06339	-0.01548	0.10298	0.09249	0.02594	-0.04919	-0.09621
40	-0.10340	-0.00663	0.10208	0.17453	0.02179	-0.17972	0.04407	0.05985	-0.01341	-0.30390
41	0.18762	0.12077	-0.06532	-0.02316	0.04411	0.18350	-0.09709	-0.02184	-0.03705	0.09069
42	-0.00864	0.02766	-0.16662	-0.17026	0.09631	0.08491	-0.20013	-0.04566	-0.04067	0.00113
43	-0.23676	-0.14137	0.09974	0.03095	-0.11403	-0.09728	-0.25111	-0.13036	0.00112	-0.51163
44	0.11198	0.12200	0.05853	0.13549	0.07101	0.02921	-0.18647	-0.02247	-0.05916	0.08718
45	0.02337	0.14196	0.12184	0.04038	0.09002	0.06593	-0.34063	-0.15432	0.07003	0.00234
46	-0.05806	0.11048	0.08771	-0.35119	0.10894	0.04352	-0.00869	-0.07074	0.00390	0.33671
47	-0.13380	-0.08313	0.02676	0.16158	-0.09558	-0.09570	-0.11641	-0.04962	0.04502	-0.53641
48	-0.07482	-0.16081	0.00552	0.19668	-0.13959	-0.15121	0.11476	0.08750	0.01596	-0.24428
49	0.21217	-0.02780	-0.12432	0.10798	0.00392	-0.07853	0.59301	0.40323	-0.05056	0.07715

c. Complete Solution (Cont'd).

	11	12	13	14	15	16	17	18	19	20
										?
1	-0.00301	0.13303	-0.03612	0.12264	0.01647	-0.00115	0.02648	0.01532	0.05177	0.02461
2	0.03199	0.04762	-0.03992	0.25312	0.07356	0.41025	-0.04523	0.02217	0.01694	0.00562
3	0.06284	-0.07913	-0.01920	0.05199	-0.05121	0.50154	0.01315	0.01647	0.05457	-0.05469
4	-0.10656	-0.00951	0.01910	0.00686	-0.04215	0.03260	-0.04212	0.10220	-0.01270	0.07496
5	-0.16125	-0.13949	-0.02364	0.15026	0.00886	-0.05999	0.07270	0.02841	0.17474	-0.13168
6	0.00911	0.01669	0.51846	0.09872	-0.01649	-0.01828	-0.00493	-0.00595	-0.03061	0.02120
7	-0.03701	0.02097	-0.02943	0.04427	0.12942	0.04575	0.16995	0.07469	0.39613	-0.00091
8	0.57762	0.00879	0.03947	-0.08794	0.06753	0.03923	0.04432	0.03375	0.01111	0.05875
9	0.0[illegible]011	0.04827	-0.07084	0.06375	-0.13675	0.05721	0.02057	-0.00145	-0.00811	-0.05834
10	-0.04444	-0.02144	0.03519	-0.07622	-0.08379	-0.05748	0.09770	0.00579	-0.01766	0.11241
11	0.02686	0.11446	0.05623	0.11292	-0.01612	-0.00948	-0.07673	-0.00394	-0.03799	-0.05715
12	0.36644	-0.11513	0.00777	-0.12145	0.03608	0.10133	0.04751	-0.00707	-0.05735	-0.00362
13	0.52951	-0.04150	0.01204	0.12352	0.63025	0.06013	0.05583	0.01397	-0.06403	0.02068
14	0.02971	-0.04520	0.10848	0.42335	-0.09939	0.03793	-0.02284	0.09846	0.02578	0.00254
15	0.03741	0.01415	0.06532	0.02920	0.03160	0.02401	0.37460	-0.05375	0.13085	-0.00075
16	0.07770	-0.00182	-0.02271	-0.04261	-0.12489	-0.03230	0.30993	-0.06904	0.11222	0.05401
17	-0.05634	0.01416	-0.15734	0.08107	0.09811	0.06601	-0.02691	-0.06947	-0.07656	-0.04263
18	-0.00894	0.03594	0.01362	-0.05516	-0.05913	-0.16539	-0.10890	-0.03761	0.04382	-0.03926
19	-0.04467	-0.05166	0.03020	-0.05145	0.14238	0.15416	0.01635	-0.00712	0.12076	-0.02133
20	-0.02835	-0.01622	0.08054	0.39676	0.00600	0.13774	0.01494	-0.02866	0.01097	0.03537
21	0.06201	-0.05692	0.46160	0.11294	-0.03031	-0.02356	0.05830	-0.02739	-0.00904	-0.00366
22	-0.07363	-0.00746	-0.02288	0.06312	0.02990	-0.00352	0.00683	-0.03498	0.04308	0.08457
23	0.00132	0.07262	-0.07174	0.03643	0.04094	-0.09302	-0.02780	-0.04772	0.08107	0.11164
24	0.04431	-0.02166	-0.02095	-0.01168	-0.00166	-0.00643	-0.05143	-0.01313	0.00880	-0.11077
25	-0.04039	-0.07348	-0.03960	0.10214	-0.13592	-0.06796	0.16105	-0.10049	-0.01568	0.02058
26	0.12317	0.07276	-0.09670	-0.02251	0.08516	-0.14224	0.06433	-0.01197	0.09200	0.07447
27	-0.00596	0.17845	-0.11009	0.10270	-0.19018	0.01508	0.00537	-0.03874	0.02462	0.12674
28	-0.00060	0.05670	0.00032	0.11721	-0.11138	0.08291	-0.12658	-0.00132	-0.10281	0.03554
29	0.06481	0.09230	0.04492	0.05414	0.00873	-0.10836	0.05834	0.04829	0.01300	0.10166
30	0.04472	-0.04412	0.04467	0.16699	0.17001	-0.06886	0.01927	-0.04140	0.02201	0.06836
31	-0.01025	-0.04715	0.00782	0.02728	0.03887	0.01873	0.01451	0.02330	0.01184	-0.01049
32	0.02765	-0.10001	-0.01130	0.07253	0.00860	-0.13451	-0.04519	0.07674	0.05963	0.01179
33	0.09758	-0.05187	-0.01369	-0.04046	0.27933	0.00640	-0.01782	-0.00312	0.01134	-0.03868
34	-0.02351	0.04725	0.03971	-0.02215	0.03633	-0.05026	0.05357	-0.00798	-0.05113	-0.01766
35	0.02197	0.25668	-0.00839	-0.02021	-0.06369	-0.03161	-0.05300	-0.02914	0.06101	0.05475
36	-0.02635	0.14301	-0.00230	0.00611	0.13442	-0.09901	0.02932	0.00590	0.00951	-0.17988
37	0.05920	-0.35731	0.04945	0.00362	-0.05432	-0.09342	-0.11862	-0.12011	0.07364	0.02147
38	0.04894	0.17420	-0.04788	0.04527	-0.01489	0.01564	0.09501	0.03117	0.02441	-0.01911
39	0.05222	0.02654	-0.02141	0.06481	0.16659	0.03646	-0.07199	0.31733	0.09587	0.02485
40	0.01879	0.19872	-0.01242	-0.07392	-0.19363	0.12930	0.05118	-0.03497	0.27934	-0.03567
41	0.02871	0.10376	-0.04659	-0.02964	0.43315	0.01651	-0.06489	0.14979	0.14256	0.01770
42	0.07816	-0.26539	-0.09374	0.03197	-0.07059	-0.01848	0.05174	0.10491	0.06982	0.06069
43	0.01799	-0.05529	0.00027	-0.01397	0.01576	0.01258	-0.12736	0.00036	-0.01947	0.02807
44	0.00299	0.35895	0.04744	-0.01325	0.07256	-0.01352	0.01731	-0.06695	0.07737	0.04286
45	-0.01111	0.15454	0.03807	-0.04124	0.12886	-0.05333	-0.05397	0.00761	0.06733	0.03716
46	0.02117	-0.37931	0.04772	0.01462	0.00649	0.02366	-0.00283	-0.06065	0.08456	0.03897
47	0.11420	0.04856	-0.01446	0.01567	-0.03691	-0.07832	-0.09040	0.04438	-0.02543	0.01856
48	-0.07992	0.29123	0.14956	-0.01634	-0.04662	0.01370	0.04418	0.03540	-0.84095	0.03285
49	0.08568	0.10516	0.01347	-0.02042	-0.00456	0.04136	0.03155	-0.02308	-0.01849	-0.08781

APPENDIX E

A SHORT GLOSSARY

A Affectothymia (A+) vs. Sizothymia (A^-).

Warmhearted, Outgoing, Easygoing, Participating vs. Reserved, Detached, Critical, Aloof, Stiff.

B High Intelligence (B+) vs. Low Intelligence (B^-).

C Higher Ego Strength (C+) vs. Emotional Instability or Ego Weakness (C^-).

Emotionally Stable, Mature, Faces Reality, Calm vs. Affected by Feelings, Emotionally less Stable, Easily Upset, Changeable.

E Dominance (E+) vs. Submissiveness (E^-).

Assertive, Aggressive, Competitive, Stubborn vs. Humble, Mild, Easily led, Docile, Accommodating.

F Surgency (F+) vs. Desurgency (F^-).

Enthusiastic, Heedless, Happy-go-lucky vs. Sober, Taciturn, Serious.

G Superego Strength or Character (G+) vs. Low Superego Strength or Lack of Acceptance of Group Moral Standards (G^-).

Conscientious, Persistent, Moralistic, Staid vs. Disregards rules, Expedient.

H Parmia (for "parasympathetic immunity to threat") (H+) vs. Threctia (for "susceptability to threat") (H^-).

Adventurous, "Thick-skinned", Socially Bold vs. Shy, Timid, Restrained, Threat-sensitive.

I Premsia (for "projected emotional sensitivity") (I+) vs. Harria (I^-).

Tender-minded, Sensitive, Dependent, Overprotected vs. Tough-minded, Rejects Illusions.

L Protension (for "projected inner tension") (L+) vs. Alaxia (L^-).

Suspecting, Jealous vs. Trusting, Accepting Conditions.

M Autia (for "autistic" or "internally autonomous") (M+) vs. Praxernia (M^-).

Imaginative, Bohemian, Absent-minded vs. Practical, Has "Down to Earth" Concerns.

N Shrewdness (N+) vs. Naivete (N^-). Astute, Worldly vs. Forthright, Unpretentious.

O Guilt Proneness (O+) vs. Untroubled Adequacy (O^-).

Apprehensive, Self-reproaching, Insecure, Worrying, Troubled vs. Self-assured, Placid, Secure, Complacent.

Q_1 Radicalism (Q_1+) vs. Conservatism of Temperament (Q_1-).

Experimenting, Liberal, Analytical, Free-thinking vs. Conservative, Respecting Established Ideas, Tolerant of Traditional Difficulties.

Q_2 Self-Sufficiency (Q_2+) vs. Group Dependency (Q_2-).

Self-sufficient, Resourceful, Prefers Own Decisions vs. Socially Group Dependent, A "Joiner", and Sound Follower.

Q_3 High Strength of Self-Sentiment (Q_3+) vs. Low Self-Sentiment Integration (Q_3-).

Controlled, Exacting Will Powers, Socially Precise, Compulsive, Following Self-Image vs. Uncontrolled, Lax, Follows Own Urges, Careless of Social Rules.

Q_4 High Ergic Tension (for tension resulting from unsatisfied (frustrated) drive of any sort) (Q_4+) vs. Low Ergic Tension (Q_4-).

Tense, Frustrated, Driven, Overwrought, Fretful vs. Relaxed Tranquil, Torpid, Unfrustrated, Composed.